From the Editor:

Perspectives on 2015: A look forward.

In this issue you will find a series of articles which look at the future. None of the authors pretend to be prophets but it is altogether fitting that an attempt to foresee the future be undertaken. It is extremely difficult to prepare now for an uncertain future if that future cannot be forecast with some degree of certainty. It therefore behooves those who have the responsibility for shaping the future to peer into a crystal ball from time to time. Having done that , we must be responsible to both prepare for that future and also realize that through those efforts of preparation we are shaping that future to a great extent.

Traditionally, in doing analysis of this type an easy way of prioritizing the information is by looking at the regions of the world. It naturally falls to hand as we have regional CINCs, regionally focused analysts, and regional focused forces. However, transnational organizations and threats have emerged as major players on the world scene, especially since September 11, 2001. These organizations threaten not only our security but our paradigms of analysis. For our purposes there is still utility in the old paradigm and the articles contained herein are arranged in a predominately regional fashion. There are, additionally, articles prognosticating in the fields of economics, chemistry and physics.

The theme of looking forward will also provide the theme for our fall issue. In that issue we hope to present additional focus on how the military proposes to address the future in the light of our war on terrorism, the uncertainty of the international environment, and current operational issues. In this issue we look at the over arching context of the future, in the next we will look at specific futures for the services and commands

The ***Airman-Scholar*** invites both full-length articles and short "letters to the editor" comments. Please submit in accordance with the following guidelines:

1. Full-length articles should be approximately 6,000 words in length, although all submissions will be considered.

2. Articles should be submitted as hard copy with accompanying 3.5 disk (not returned)

3. Articles will be edited to conform with Airman-Scholar format; proofs will not be sent to authors prior to publication.

4. Articles are encouraged from all knowledgeable members of the academic and military communities. Publication of outstanding papers by USAFA cadets and other service academy students is a particular goal of ***Airman-Scholar.***

5. Articles must be received by **1 September 2002.**

6. Send articles to:

34th Education Group
Attn: Airman-Scholar
2354 Fairchild Drive, Suite 2A2
USAF Academy, CO 80840-6264

AIRMAN SCHOLAR

Published by the 34th Education Group
at the
United States Air Force Academy

Spring 2002
Vol VIII, No 1

Commandant of Cadets
Commander 34th Training Wing
Brig Gen S. Taco Gilbert III

Commander and Permanent Professor,
34th Education Group
Col Thomas A. Drohan

Editor
Glenn Ferguson

Assistant Editor
Maj William R. Pearson

The 34th Education Group's mission is to oversee curriculum development and instruction in Military Strategic Studies for the cadets of the US Air Force Academy. This consists of courses covering Military Theory and Strategy, Officership, Airmanship, Aerospace Theory and Doctrine, and Joint and Coalition Operations. Group personnel conduct research on a variety of topics, including international security, space-related issues, military service culture, and educational modeling. Research activities are coordinated through the 34th Education Group Research Office.

AIRMAN SCHOLAR is published twice annually. If you have comments concerning articles, would like to contribute an article for publication, or desire to receive AIRMAN SCHOLAR, please contact us at:

34th Education Group
att: AIRMAN SCHOLAR
2354 Fairchild Drive, Suite 2A2
USAF Academy CO 80840-6264
(719) 333-3255 or DSN 333-3255
e-mail: 34EDGAirman.Scholar@usafa.af.mil

TABLE OF CONTENTS

1 From the Editor
Perspective on the Future: 2015
Glenn Ferguson

2 **Sub-Saharan Africa**
African Studies Group, USAFA

4 **The Americas**
Col Douglas Murray, PhD.
Professor Curtis Cook, PhD
Lt Col (Ret) Vic Nell
Maj Matthew Anderson
Maj Dave Spoon

10 **Europe 2015: The Old World in a New Century**
Charles Krupnick, PhD.
Deron Jackson

18 **Proliferation Drivers in the Middle East**

27 **Northeast Asia: Japan, China and The Two Koreas**
Col Thomas A. Drohan, PhD.
Paul J. Bolt
William E. Berry, Jr PhD.

33 **Russia**

36 **"All Our Tomorrows"**
Ed. Maj Susan E. Hastings
Capt Jim F. Blankenship, PhD.
Capt Jennifer S. Gresham
Capt Kyle D. Gresham, PhD
Barry W. Hicks, PhD.
Maj Luke A .Lorang
Maj Ronald C. Marks, PhD.
Capt Daniel b. Ryan
Capt Curtis L. Weeks
John S. Wilkes, PhD.

39 **Economics: Global Issues 2015**
Lt Col Sohan
Lt Col Frank
Dr. Waller
Capt Carpenter
Capt Paik

41 **Physics & Nuclear/Radiological Science**
Lt Col Geoff McHarg
Maj Mike Dearborn
Capt Andy Dills

Sub-Saharan Africa

Rather than paint a picture of different possible scenarios with a guess at their probability, this report identifies seven major areas that will have direct implications for U.S. foreign policy in 2015. They are: transitions of states from fragile democracies into authoritarian regimes with the concomitant curtailment of civil, political, and economic liberties; the continuing outbreaks of internal, civil conflict in states, with possible increasing involvement of other African states; the phenomenon of the failed state, in which all of the normal mechanisms that serve to maintain order within a state have collapsed; recurring humanitarian and natural disasters; the increasing importance of some African states as sources of important resources; the pandemic of AIDS and other virulent diseases; and the possibly increasing influence of anti-Western Islamic leaders in the politics of Sub-Saharan states.

Transitions from Fragile Democracies to Authoritarian States

Transitions to democracy will remain incomplete and will follow unpredictable courses in many states. In some cases, optimism about political liberalization and the development of the rule of law will fade, as political elites will seek to consolidate their power and reap personal gain from the control of the state. In other instances, there will be military coups. As in other areas of the world, criminal syndicates will operate and even in the more stable democratic states, cronyism and corruption is likely to be prevalent. In West Africa and increasingly in Southern Africa, narcotics trafficking will be present. Where demagogues choose to play the ethnic card to rally political support, relations between ethnic groups will be problematic; where there are white minority landholdings (as in Zimbabwe), racial violence, politically motivated, may erupt.

South Africa will continue to experience problems involving law enforcement and criminal activity. However, its political institutions will remain relatively strong, as long as its leadership remains committed to a multiracial society that stresses ethnic cooperation. The importance of South Africa to the United States will continue to grow; the strengthening of law enforcement capabilities and the enhancement of understanding of civil-military relations will be of paramount concern to the U.S. in this state, which is capable of resuming a nuclear program, should the political/military elite change its current anti-nuclear disposition.

Continued Internal Conflict

Many African states will continue to be wracked by internal conflict. These kinds of conflicts will be fueled primarily by a desire for control of wealth and resources rather than by ideological divisions. "Blood diamonds" will continue to be a factor in West African conflicts, and the triangular trade of resources for weapons used in civil conflicts, especially through illicit operations, has to be of paramount concern to the United States.

...wartime atrocities are likely to continue

Because of the nature of these conflicts, in which paramilitary groups and irregular forces are the primary actors, wartime atrocities are likely to continue. It will remain difficult if not impossible to expect these forces to respect the laws of armed conflict. In addition, international security forces, sent in to assist with cease-fires and other peacekeeping measures, will increasingly come under attack, as the inviolability of these kinds of operations will not be respected. Even aid workers and non-governmental operations will increasingly be at serious risk in these internal crises.

The primary weapons of these irregulars will be small arms. Therefore, arms transfers and trafficking should be of critical concern to the United States. Organized crime may become even more involved in arms trafficking, which is often combined with drug peddling in a volatile mix. The proliferation of small arms on the subcontinent fuels internal conflicts and makes them more difficult to resolve. This undermines efforts toward stability and democratization.

Land mines will continue to be a problem where conflict has ceased. Although some conflicts may be impacted positively by the intervention of regional forces, in some cases these forces will plunder the areas in which they operate.

The Failed State

This report predicts that the phenomenon of the failed state in Africa is likely to recur. Somalia is as yet unstabilized, and the DRC (Democratic Republic of the Congo) will remain essentially ungoverned, in spite of increased involvement of the international community in the conflict over territory, governance, and resources. In both the cases of failed states and internal chaos – in fact, wherever the rule of law is weak or nonexistent – we may expect to see the development of criminal activities and syndicates, and fertile ground for terrorist cells to flourish.

Continuing Humanitarian and other Disasters

While not the only global source of humanitarian problems, Africa will figure prominently in these concerns. Internal conflict will continue to produce massive population movements both within and between African states. The difference will be that refugee populations will be increasingly unwelcome in some host states that were formerly cooperative in receiving and helping displaced people. The barriers between African states are likely to go up, rather than come down, as African states are further divided into stable, better-off states and unstable, less well-off states.

In addition, requirements for the protection of these large refugee populations will become ever more important. Vehicles for the security of refugee movements and camps and also for the protection of aid workers involved in humanitarian operations will be sorely lacking. Therefore, disturbances and human suffering will accompany every large population movement.

Population movements may be used as covers for insurgent operations – refugees may be human shields in some cases and refugee populations may actually harbor and serve as bases for guerilla operations in others. In all cases, humanitarian supplies will be at risk in civil conflicts. The demilitarization of camps will in all cases be problematic and will require substantial law enforcement support.

Organized crime may become even more involved in arms trafficking, which is often combined with drug peddling in a volatile mix

South Africa is likely to continue to emerge as the main force for conflict-resolution in the Southern portions of the subcontinent. Nigeria will likely exert some influence in Western Africa, but may itself undergo considerable internal disruption due to regional differences and instability.

Desertification will continue to affect portions of the northernmost zones, and drought and flooding will undoubtedly continue in other areas of Africa due to climactic global changes and other factors.

Some of the more important human rights issues emanating from Africa will be issues concerning slavery, trafficking in narcotics and women, landmines, wartime atrocities, suppression of civil liberties and political dissidents, corruption, and lack of law enforcement to protect civil society and its operations.

Growing Importance of Some African Resources

While much of Africa will remain economically peripheral to the world economic community, South Africa and Nigeria will become increasingly important. Oil from Nigeria will figure more importantly in international economics as the world searches for alternatives to usual sources of oil; South Africa will continue to be an important trading partner for many developed nations and several African nations. Unless the civil unrest and internal chaos of several African nations can be curtailed, the prospects for foreign investment in Africa and increased involvement of the subcontinent in the global economy looks somewhat dim. Tourism will only return to important levels as the security situation in Africa improves.

The Pandemic of AIDS and the Danger of other Diseases

Africa, where health care expenditures per person are substantially lower than in any other part of the world, will continue to experience a tragic crisis in the form of AIDS. This crisis will not abate, but may be impacted by good governance in some states and substantial international assistance. In other states, in which leaders deny the importance of the crisis, or in which resources to combat the disease are severely lacking, the future will see states with disrupted families and communities, a depleted labor force, and a substantial number of children who have been orphaned by AIDS. These children will in many cases become alienated – many will have lived their entire lives on the streets. State facilities to assist orphans and families will be overwhelmed by the disaster. The disease will continue to run rampant in Sub-Saharan Africa due to large migrant populations, lack of education, the patriarchal society and a culture of sexual permissiveness, and the poor immunological health of the general population.

Kaddafi's desire to become a regional leader and to spread Libyan and Islamic influence ...may not subside,

The population that will be hit the hardest by AIDS in many countries is the military, civil service, and middle management in the private sector. The high infection rates among these leaders will have devastating effects on political stability in the near future.

In addition, the subcontinent is likely to experience outbreaks of Ebola-like diseases. Until the general health environment and resources or Africa are improved, the risk of these diseases being transmitted outside of Africa is likely to grow with ever-increasing global interconnectedness.

Possibility of Growing Influence of Anti-Western Islamic Leaders in Africa

There is a possibility that the influence of Libya in African politics will increase. Kaddafi's desire to become a regional leader and to spread Libyan and Islamic influence throughout the subcontinent may not subside, and he may have a growing impact on the region. Portions of the substantial Islamic population of many African states may become increasingly open to anti-Western rhetoric, as the gap between the rich and poor states continues to grow and as governments are unable or uncommitted to meeting the needs of the general population. Libya and Sudan may be less likely to harbor terrorist training operations as they become more integrated into the global economy.

However, Western symbols and institutions are likely to continue to be vulnerable to terrorist attack in Sub-Saharan Africa, as the weakness of the rule of law affects the protection of foreign nationals in the region and inhibits prevention or early detection of terrorist activities.

African Studies Group
Dr Fran Pilch,
LtCol Deb Schmitt,
Maj Jim Faber,
Capt Jennifer Joyce
United States Air Force Academy

The Americas

OBJECTIVE: To Identify trends in the political, military, and economic arenas in order to develop three or four alternative futures for the region defined as the Americas – specifically North and South America – the Western hemisphere. These alternative futures will be used to determine the future direction of arms control.

TASK 1: Identify trends in the following issue areas from which we will then build our view of alternative futures.

Military Trends

Canada

Trends do not point toward increased military spending or a radically different role for the military in Canadian security matters. Canada will continue to look to the US for overall North American security and as such will continue to maintain numerous defense relationships such as NORAD and NATO with the US. A change in this relationship would most likely occur as a result of action taken by the US in terms of their overall security strategy in supporting defense organization and structures. Canada will continue to regard defense issues as secondary to economic and domestic political questions. The Canadian military has a keen interest in obtaining helicopters and other force-mod equipment from the United States. The National Missile Defense (NMD) system will play an increasingly important role as the new administration pushes toward further development of the NMD. The Canadians strongly desire to remain under the umbrella of protection that encompasses North America, yet are wary of increased financial burdens that the NMD may impose upon their military budget. The Canadian military also seeks to continue, if not expand their role in international peacekeeping operations through the UN and other Intergovernmental Organizations (IGOs). Traditionally, the Canadian government has championed arms control agreements, and most recently has led the charge in developing an Anti-personnel Mine Treaty, the Ottawa Treaty. The government was also a strong supporter of a western-hemispheric nuclear free zone. Economically, Canada seeks to open military arms markets with Latin America and expand economic ties to Latin America through the FTAA.

Canada has a weaker constituency for national security than does the U.S. Canada's traditional association with multinational peace operations persists but recent experiences (Somalia, Rwanda) in this arena have been discouraging. While a weakening the national motivation along these lines is not detectable at the moment, these recent Canadian experiences are no plus for support of peace operations assignments. Nor does Canada have an arms industry to carry the arguments. The willingness, albeit reluctant, to follow America's lead as to North American defense is not likely to change.

With these parameters in mind, increases in defense spending in Canada are likely to follow a social welfare criterion (pay and benefits). Force modernization is not likely to occur under its own terms, although necessary replacement of aging equipment might lead to some improvements in capabilities. The Canadian military would be more likely to obtain helicopters and other force-mod equipment from the United States than from other suppliers.

Globalization has cast a fragile shadow of cooperation in the region, which may be threatened by increased regional instability resulting from the drug trade

Opposition to NMD seems to be softening. Canada has many reasons to be apprehensive about NMD (expense, diplomatic alignments). The Canadians can be expected to choose to remain under the umbrella of protection that encompasses North America. As the other democracies accommodate to NMD, and the sharper objections of Russia and China are dealt with, then Canada can be expected to accept the results. We should not expect Canada to contribute to NMD financially.

Latin America

Trends in Latin America are difficult to characterize due to the diffuse nature of the countries considered "Latino". Each country pursues its own agenda and also seeks to establish regional development and common goals in military operations and inter-operability. Globalization has cast a fragile shadow of cooperation in the region, which may be threatened by increased regional instability resulting from the drug trade. Currently, there exists a vacuum in policy regarding Latin America. Current trends indicate that the militaries will continue to develop their conventional capabilities in the near term. Specific cases point toward increased operational and equipment demands: Colombia, Ecuador, Nicaragua, Venezuela and Curacao.

The trends also point toward a growing scope of military use in internal matters as the mission, technology and use of conventional forces adapts toward anti-drug warfare. Currently in the southern cone, Argentina, Chile and Brazil are engaged in an active and productive arms trading industry. Specifically, Brazil has made great progress toward mid-sized aircraft industry, and currently supplies the commercial US flag carriers with many commuter jets and turbo-props. Also, in the Brazilian case, Brazil has retained the right to construct and utilize rocket launch platforms as a condition to ratification of the nuclear non-proliferation treaty and the test ban treaty. As regional technology continues to develop, jamming potential for EW and monitoring programs continues to draw concern.

Threats to Latin American militaries center around narco-traffic and narco-terrorist activities that stem from the drug trade. Politically, the control of society has become a military matter in densely populated urban areas such as Sao Paulo and Rio de Janeiro, Buenos Aires, Mexico City, and others. Narco-terrorists and extremist groups have also increased their activity in terms of political kidnappings for monetary gains as well as for political purposes. In some cases, the military has been called upon to assist in the resolution of such events such as in Peru during the Tupac Amaru hostage crisis at the Japanese Embassy. Insurgency movements in Latin America have traditionally served as avenues for social and political change, and have been more readily accepted as legitimate and viable means of affecting change. Many documented cases serve to illustrate this point: Colombia, Mexico, Peru, El Salvador, Nicaragua, Chile, Argentina, and Brazil all have experienced social and political change as a result of insurgency movements. This trend seems to be waning in light of global awareness and human rights

movements on a truly world scale. Other threats to the militaries of Latin America include the social and economic plight of the urban poor, and the ideological based insurgencies that these conditions generate.

Politically motivated insurgencies such as in Colombia, El Salvador and Nicaragua further illustrate the deeply etched lines of the insurgent mentality in Latin America. In Colombia, this ideological movement attempts to legitimize itself through a grassroots social revolution, which is counter-productive to the political process. This mentality, although exposed on the global scale, is not likely to disappear until lasting reforms and political equality can be instituted throughout the region. Indigenous movements in Chiapas, Mexico and in the Brazilian Amazon further illustrate the political and ideological based movements that remain common throughout the area. Two cases merit special mention in terms of military threats in Latin America during the first decades of the 21st Century.

Cuba must come to terms with the issue of Castro's successor and his legacy. They must determine the ultimate goal of their revolutionary movement and how to best obtain those goals. Issues that will need to be addressed in this respect include: political ideology, opening of trade, foreign investment in Cuba, and tourism. Ideologically, Cuba must determine if it intends to remain the bastion of communism in the western hemisphere along with Venezuela, and whether or not it intends to remain the prototype for Chinese communism in the Caribbean basin. Finally, Cuba must decide if it will maintain an authoritarian political and military base, or whether it will adopt a neo-liberal economic model for development in both the political and economic arenas. The second case, Venezuela, exhibits other unique tendencies. As the only OPEC member in Latin America, Venezuela maintains a unique position to affect the world oil supply and petroleum prices. Hugo Chavez remains, like Castro, a self proclaimed social democrat (we use this term loosely) and often resists US pressures and policies in the Americas. As in the Cuba case, Venezuela must determine for itself, what direction the country will take in the 21st Century. In terms of US policy toward Latin America, generally we see two trends. First, in the 20th century, the primary impetus of US policy in the region was the containment of communism.

Second, in the 21st century, the primary impetus of US policy in the region has shifted to economic and trade relations. The direction of these changes points toward an eventual union such as the FTAA in order to keep pace with the economic power of the EU. Finally, our analysis of military issues in Latin America led to the discussion of the Panama Canal and issues surrounding the transition of the canal operations from US to Panama in December 1999. The Chinese based firm, Hutchinson-Whampoa, now controls the canal ports while the Panamanian government controls the canal itself. In terms of military application, the US has reserved the right for first use in cases of emergency, a very loosely worded condition to the canal treaty signed by Presidents Carter and Torrijos. Furthermore, the modern military surface vessels cannot navigate the canal due to size restrictions, and must travel in open seas. The possibility of widening the Panama Canal has been discussed, as well as construction of a new sea-level canal through Nicaragua. However, the main threat to canal security remains the illicit drug trade and military use of the areas in the Canal Zone for counter-drug operations.

Cuba must decide if it will maintain an authoritarian political and military base...

Political Trends:

Role of Military in Political Process and Democratization

Canada

A well-established parliamentary government with a multi-party system, Canada is as committed to the Anglo-Saxon model of civil-military relations as the U.S. is, if not more so. Moreover, Canada's system is stable, despite the pulls of Quebec separatism and alienation in the west. A parliamentary system is capable of sharp changes in direction if the voters provide such a mandate. And Canadian parties are in a state of flux, with a new western and especially conservative party attempting, so far with little success, to become national. That effort is not propitious, however, unless the party (Canadian Alliance Party) moderates. So Canada's foreign policy is likely to proceed along the track already established. Military influence in Canadian foreign policy is slight and likely to remain so. Canadians traditionally use diplomatic and economic tools for bargaining and negotiation rather than resort to military force.

The separatist movement in Quebec is alive and well, although according to public opinion actual separation from Canada commands somewhat less than a majority. This is likely to remain the case. But some unexpected shock to Canada, or gross mismanagement of separatism from Ottawa, could fall to the advantage of the Parti Quebecois. Were Quebec to vote for secession, however unlikely, then all bets are off.

The military has remained outside the separatist political debate and has played no role in the separatist movement. Military service academies, for example, have been integrated into one bilingual campus at the Royal Military College (RMC).

Canada continues to support open borders with the United States and encourages immigration with no quotas on immigrants. One of the security concerns for the US must be the access to US territory through Canada for terrorists and subversive elements opposed to the government of the United States.

Latin America

Legitimacy has been the key for most political, social and military movements throughout Latin America. This trend seems likely to continue as most Latin American countries further develop economically and politically. The military in countries such as Argentina and Brazil, have made great progress toward legitimacy in recent years. Both countries have sent missions to Africa and the Far East in support of UN peacekeeping operations, and both countries have created a civil-military chain of command that closely resembles that of the United States. In fact, military professionalism as a subset of civilian democratic rule seems to be the key to legitimacy for most Latin American countries. Exceptions to this are Paraguay, Chile and Venezuela. In Paraguay, for example, the strong gaucho cul-

ture indicates a continued authoritarian view of civil-military relations. In Chile, similarly, a large percentage of the lifetime federal senators are former military (who, incidentally, are immune from prosecution for human rights abuses during the Pinochet regime). Finally, in Venezuela, the Chavez regime with its socialist platforms maintains a more authoritarian approach toward the political process. On the democratization side, countries such as Mexico and Guatemala have both made progress toward a more democratic society with the assistance of the military. In Mexico, the PRI peacefully turned over control of the presidency last year when Vicente Fox won the presidential elections. In Guatemala, the civil war led to democratic reform, yet the long-term effects of the Guatemalan democratization case remain to be seen.

Generally in Latin America the trends point toward more open elections and further development of civilian controlled militaries. Stability and democratization within a multi-party system seems to remain constant with continuing erosion of military influence in the political process. The US serves as the role model for most of these nascent democracies, and political-military relations seem to continue on current paths toward greater cooperation in pursuit of international legitimacy and democratization. The social impact of miscegenation between Iberain, African, and America peoples has perpetuated a love-hate relationship with the United States. Most 'Latinos' prefer US products from Coca-Cola to Ford automobiles, yet they disdain US influence over economic and political freedom and sovereignty of their nations. Here, the tendency is toward maintaining sovereignty at all costs; pride and nationalism among the Latin American democracies lead them to see US influence as a double-edged sword.

Trends identified in Global Trends 2015, cite the possible difficulty for the Caribbean basin in dealing with increasing violence and social-democratic problems resulting from proximity to other South American countries in turmoil. We believe that this problem goes beyond the Caribbean and will begin to adversely affect the incremental consolidation of the more "stable" Latin American democracies. Most notably, the current situations in Colombia and Mexico will have increasingly negative influence on neighboring countries and the Caribbean region.

The drug trade in Colombia, along with other nareo-traffic and terrorist activities will impact more than simply the Caribbean and Central American countries. As noted in the Global Trends 2015 paper, the drug trade has far reaching consequences. The continued failures of Colombia to combat vast social and institutional problems will continue to have adverse impact on the region as a whole, not simply the Caribbean Basin.

Mexican involvement as a transshipment area also raises concern for the entire region when addressing the issues of drug related international crime. Furthermore, Mexico, with a new political party leading the country has taken on increased importance in US economic policy and diplomatic relations. Indigenous movements, as in Chiapas, we believe will continue to influence the Mexican government's programs and policies. The legitimacy and consolidation of the Mexican social and political systems will most likely be reflected by the government's ability to successfully deal with the indigenous movement's demands through compromise and negotiation.

The drug trade in Colombia, along with other narco traffic and terrorist activities will impact more than simply the Caribbean and Central American countries.

Economic Trends

NAFTA

Trends indicate that the United States, Canada and Mexico will continue toward greater economic cooperation. Largely characterized as a success in the north, in term of real economic development and stabilization, the NAFTA members would like to expand the free trade agreement to other states in the western hemisphere. The labor practices and standards have not been characterized as successful in NAFTA cooperation, and the environmental protection aspects of NAFTA have met with mixed success. Economic growth and stabilization indicate clearly that future potential for expansion of the free trade agreement and future border openings. Trends also point toward less controls on immigration between the US, Canada, and Mexico and greater economic cooperation as well. The success of NAFTA has spurred Canada to consider adoption of the US$ as its formal currency. This trend also is seen in some Latin American countries that have already adopted the US$: Ecuador, El Salvador, and Panama; and others that have pegged their currency to the US$: Argentina, Costa Rica, and Brazil (recently taken off the US$ standard).

MERCOSUR

As a trading bloc, MERCOSUR (whose membership includes Argentina, Bolivia, Brazil, Chile, Paraguay, and Uruguay) has little impact on US trade in the northern hemisphere. This is a trend that will certainly change with increased trade relations between MERCOSUR and the EU. The western hemisphere must consider these trade opportunities and act upon them before losing out to European competition. As a trading bloc, the western hemisphere could exert as much influence on global economic trade as the EU currently demonstrates. Economically, Latin America is moving away from the category of "underdeveloped" and into the category of "developing" or even "developed" economies. Many scholars now believe that a 2nd World exists that exhibits tendencies of both developed and developing countries. These countries show tremendous extremes between poverty and affluent sectors of society. They are also characterized by "pockets of poverty" in regionally depressed areas. The goal of MERCOSUR inevitably is to expand economic potential and growth for member countries and press for further economic independence from the global north.

CBI

The Caribbean Basin Initiative has had less impact in recent years than the Caribbean states would have liked, however, the region remains economically important due to the nature of current offshore banking practices. Often referred to as the new Switzerland of financial safety, the Caribbean is replete with legitimate and shadow financial organizations used to shelter money and launder money respectively. The offshore financial industry has somewhat setback the efforts of NAFTA to promote free trade in the region and has created difficulty for law enforcement agencies in tracking

the money laundered in relation to narco-traffic.

FTAA

Trends and talk of a Free Trade Association of the Americas have recently revived in the face of the European Union's success. A western hemispheric trade union would certainly strengthen the developing economies of Latin America, but may cause some financial difficulty for the developed northern countries. The principle opponent to the FTAA remains the US due to a lack of political support for a regional trading bloc. Chile has applied to both NAFTA and MERCOSUR and has already established a free trade agreement with Mexico, which points toward the increasing trend to establish favorable trade relations within the regional context. Similarly, Canada has opened trade with Cuba, again pointing to the importance of regional trade and the increasing trade between American states and other Caribbean islands.

Black Market

In order to avoid import and export tariffs, the black market in Latin America has grown in recent years. This is due largely to the popularity of US music, films, and goods. Illegal copies of cultural recordings, electronics, and clothing are the biggest source of income for black marketers. In fact, Paraguay is often referred to as the contraband capital of the hemisphere because so much illegal trade passes through that small country. Ironically, this illicit trade reflects the goal of increased regional trading unions and free trade agreements because the demand is so high for foreign goods.

Energy

The Global Trends 2015 paper notes that Mexico, Venezuela and Brazil will increase in Oil production by 2015. While the region has potential and interest in increasing petroleum exploration and production, the Brazilian impact on this may not be as significant as many believe. Brazil's recent difficulty with a drilling platform near Rio points to the technological and operational problems remaining in Latin America. Brazil, in particular, remains reliant on the production of alcohol in addition to gas (gasohol) for vehicle use. Therefore, we believe that the ability of Brazil to produce enough oil for domestic consumption will be difficult during the next decade. The probability for export of petroleum remains low for Brazil, but may very well increase in Mexico and Venezuela.

Social Trends

Canada

Quebec City's FTAA meeting of April 2001 witnessed the recurrence of movements protesting the concept of a free trade association, as were seen earlier in Seattle, WA. This protest was not directed against the Canadian government, any official party or individual leader, rather it focused its efforts against globalization. Students from the University of Montreal taking a course on civil disobedience marched in protest and promoted a new progressivism program against current trends of globalization, the WTO the IMF, and fiscal policy. Transnational linkages within the protest groups, such as environmental protection organizations, labor unions, and human rights organizations, seemed to contradict the underlying message of the protest in the first place. The trend points toward continued development of international pressure against free trade and its implementing organizations, with an increasing linkage between the protest groups and increasing impact of student movements on campuses across North America.

Latin America

Human development index and trends toward increased health care, welfare and civil rights seems to indicate that the trends in Latin America are toward greater awareness improved social relations among classes and ethnic groups. Urbanization has been a key factor in the rising awareness and international visibility of social conditions in Latin America. Free trade unions and agreements would also be of great assistance to the developing areas in Latin America encouraging further development, industrialization, and infrastructure improvements. Problems with social development in Latin America can be categorized into three separate and distinct elements: out-migration, the spread of AIDS, and the technological revolution.

First, out-migration trends indicate that some countries such as Colombia are experiencing an increased level of citizens fleeing the country for fear of persecution or for their own safety. Clearly this is a result of the ever-increasing problems associated with narco-traffic and the illegal drug trade. Other examples of out-migration can be seen in such cases as Haiti refugees in the United States, the massive migration from Nicaragua to neighboring Central American countries during the 1980s, and the Cuban exodus to the United States during the cold war, Guatemalan migration to Texas, and Brazilian migration to the United States and Canada. This out-migration also causes problems for the country that include such phenomenon as "brain drain", or the lack of scientific, intellectual, and research potential caused by widespread out-migration. Many Latinos are attracted to the US or Canada to study and seek employment in the technology-oriented fields. The trend of out-migration points to the flow of political refugees to the northwest, generally out of Latin America in into the developed countries of the north. These trends may be reversed as economic and political conditions in developing Latin American countries improve.

Secondly, the spread of AIDS in Latin America indicates a further trend in society. Largely Roman Catholic, Latin America represents the greatest concentration of Catholics in the world. Religious doctrine concerning birth control has created an environment that has seen a tremendous increase in the spread of infectious disease; to such an extent that the Roman Catholic Church has debated the condoning of birth control practices for prevention in the spread of disease. Other health factors such as Dengue and Hoof and Mouth Disease remain problematic as well for social improvements in Latin America.

Finally, the Technology Revolution in Latin America has created a unique environment where entire generations of infrastructure development have been completely passed over. Most of the developed regions, mostly urban, in Latin America have extensive technological capabilities without the deeper infrastructure in similar cities in the north. A prime example is abundant wireless communication capabilities in the urban areas, little wireless capability in rural areas, and no hard-wired fiber optic infrastructure in either. While the urban centers may have phone and data capacities, these are limited to the upper-middle classes due to the expense of obtaining a phone line. The computer industry,

television, radio and satellite technology in Latin America, in general, comes close to resembling that of the US or Canada, however, access to such technology remains limited in remote areas. The potential for electronic warfare seems to be increasing with the world's reliance on technology and the future for digitized battlefields of the future. Certainly the trends in Latin America point toward a greater flexibility in terms of jamming potential, especially since the systems in Latin America do not possess redundant backups in hard-wire or fiber optic systems. The electric demands and integration across nations indicate that the electrical grids between neighboring countries will continue to grow in proximity and interdependence. For example, the Itaipu Dam in South America supplies energy to Brazil, Argentina and Paraguay, while the integration of the US, Canada and Mexico indicate increased vulnerability to electronic warfare. Social movements in the western hemisphere have increased international visibility on arms control and nonproliferation agreements. Trends in this area would seem to indicate that we study the possibility of increased awareness for the possibility of further arms control movements that, like the anti-personnel mine movement, focus on conventional arms and forces rather than on weapons of mass destruction. Other non-traditional forms of arms control could include: information warfare, satellite jamming, economic warfare and subversion, political kidnappings and assassinations, and conventional weapons bans.

TASK 2: Assess projected trends identified in the Global Trends 2015 report, and other trends emerging from Task #1.

The validity of trends assessments discussed in section I, generally parallels those that were identified in Global Trends 2015 paper. The only exceptions were the following:

- Narco-trafficking already has had an adverse effect on other countries in the region, in addition to adversely affecting the Caribbean basin countries. Regional disruptions and criminal activity impede the democratization process and consolidation of stable governments.
- Legitimacy of political and military institutions, key focus for Latin American governments.
- Brazilian Oil production potential not as great as predictors.
- Technological leapfrogging may provide temporary relief but negates the benefits of redundant systems in terms of power and telecommunications. The degree to which the Latin American countries continue to prosper economically and politically will depend in large part on technology, communication and security of the power and telecommunications systems. Therefore stability in the region will depend on the region's technological development, and its ability to deter and defeat technological threats.

Task 3: Alternative futures for the Americas and their impact on Arms Control Initiatives in the Future.

We identify three broad possible futures for the Americas.

Our projected trends focus primarily on the countries still in developing stages of democratization and economic and political stability. We recognize the importance of the United States and Canada in taking the initiative for hemispheric development, solidarity, and cooperation. Traditional arms control discussions have centered on the control, reduction, and limitations of weapons of mass destruction, nuclear, chemical and biological weapons, and the means to deliver these weapons. Very little attention is paid to the western hemisphere in terms of global arms control and non-proliferation issues, this in spite of the fact that the Brazilian-Argentine bilateral non-proliferation agreements prompted these two South American powers to adopt the non-proliferation and nuclear test ban treaties. As we attempt to define Americas' futures, two important caveats stem from the fact that the US is a part of this region and is not included in our analysis. It must be noted, as we outline the futures the following two caveats:

1. The United States itself is not analyzed and therefore the trends outlined in parts 1 and 2 relate to Latin America and Canada only.
2. To a large extent, the various futures of the region will depend on the foreign policy direction, orientation, goals, and objective that the US has toward the region. In other words, which future develops will be a function of the role, and degree to which the US determines it will be involved and integrated into the region. For example, recent administrations have signaled an increased involvement and continued regional cooperation. This began with the Bush Administration in 1988, continued through the Clinton years, and remains important with the new Bush Administration today. But history clearly tells us that The US involvement has been cyclical, ranging from a high degree of interest (Kennedy alliance for progress) to reactionary policy, to benign if not malignant neglect, and finally to active interventionism and even invasion

TREND ONE:

Continuation of the Status Quo

Globally the developing countries in the Western Hemisphere take on little importance. Internally, the trends identified above will continue on a national basis. Internationally, these states will continue to be marginalized by the US due to high visibility of other regional conflicts. For example, the Middle East, Africa, and Asia, all contain issues that are demanding the focus of US policy makers. This characterizes the US history of benign neglect toward the Western Hemisphere when faced with other crisis areas that demand more attention and lessen the ability or desire to look toward Western Hemisphere issues. In this future, arms control concerns will focus on maintaining the viability of the existing on nuclear free zone and nonproliferation agreements, as well as controlling the conventional military arms sales agreements and regional trans-national arms trade. We believe that in addition, a new aspect of arms control must be considered, particularly in the Americas. Arms control addresses not just traditional armaments, but also non-traditional armaments such as jamming, power interception, cyber-warfare, and telecommunications systems. Arms control of the instruments of information warfare, and other non-traditional threats to regional security become increasingly important in this scenario

TREND TWO:

Regional Cooperation

In this future we see growing economic interdependence, positive movement in all trends identified in part I, such as FTAA, as it has in Europe, it will lead to greater economic unification, leading to greater political cooperation and the development of some type of federal system similar to the European Union. In pursuing a Western Hemisphere version of the EU, the United States must capitalize on the potential for increased interdependence, and must take direct interest in the region. This outcome is more likely to occur if the US takes a positive outlook and puts the region high on its priority list. The US must strive to further regional cooperation and development, stability, political democratic consolidation, etc… One small indicator is the growing number of WH countries either using the US Dollar as their currency, pegging their currency to the dollar, and as seen in the black markets in many areas that trade almost exclusively with dollars. This future would have the least impact on the need for arms control initiatives in the region. There would be no need for further agreements beyond the current non-proliferation and test ban agreements.

TREND THREE:

Regional Disintegration

In this future, the concept of a region all but disappears, other than a geographical reference; individual Latin American states now think more of relations with outer-regional countries in Europe and Asia than they do with neighboring and regional partners. This scenario developed from the failure of past US policy in dealing with the region. Some factors that might bring it about include:

1. US disengages from the region (which might occur if US felt no economic gain or extra-regional threat) generated by lack of a world-wide peer competitor that would use Latin America as a surrogate to achieve their goals and objectives much as the USSR did during the Cold War. The US might not care to maintain presence due to lack of interest in region. Or, US economic well-being may no longer be tied to region.
2. Internal instabilities that would tear cooperation apart. Renewal of historical animosities. No external influence, rather, internally development and alliance with outer-regional powers. A resurgent Cuba, or ties between Cuba and Venezuela to seek regional sponsor or hegemonic benefactor, may constitute a new political threat to regional stability. Hugo Chavez's anti-US stance and Castro type leadership may emerge in other countries as well, giving rise to leaders whose interests may center on building personal power base as opposed to regional cooperation. This scenario may occur if the social, political, and economic conditions deteriorate to the point of pushing these types of nationalistic leaders to seek support in alternative avenues.
3. Continued fragmentation and the rise of trans-national guerilla, terrorist and narcotics organizations that cut across traditional nation state boundaries, may further destabilize the region. For example Fujimori's exit may open the doors to another resurgent movement. Power vacuums created by other regional leaders, may spawn narcotics funded and guerilla led social-political difficulties and fragmentation. Trans-national, trans-governmental organizations may increase in cooperation, further destabilizing the region in spite of the lack of a unifying characteristic such as Islam in the Middle East. Rather, this type of cooperation might occur as the result of economic ties between narco-traffickers and guerillas. The exception, or wild card, would be native indigenous movements, whose unification and continued activism may eventually lead to the "Balkanization" of Latin America.

This scenario, our worst case one, will provide the greatest difficulty for arms control, proliferation and non-proliferation policy makers. This will result from the new focus on regional fragmentation. It is the most contentious scenario and offers the greatest danger as new contending powers compete for arms and simultaneously develop their capabilities to pursue nationalistic goals and objectives.

CONCLUSION

The three futures identified above are derived from the trends discussed in part one of this paper. They represent archtypes of what may be. What does occur might become variations of these. Also not considered was a future in which the United States would be the hegemon for the region – a true Pax Americana. We doubt such a future, but it is a possibility. With respect to global arms control issues, this region will be the least significant unless there are significant real changes of the type described in the worst-case scenario. One issue of continued importance will be arms sales and the development or expansion of arms industries in the Latin American nations. However, concerning arms control, what is significant about this region is that it foreshadows the need for a new type of arms control, one focused on controlling non-traditional instruments of force and coercion such as those associated with information warfare and possessed by trans-national and trans-governmental actors.

Panel Membership

Colonel Douglas Murray, PhD.
Professor Curtis Cook, PhD.
Lieutenant Colonel (Ret) Vic Nell
Major Matthew Anderson
Major Dave Spoon

Europe 2015

The Old World in a New Century

Deron Jackson and Charles Krupnick

Introduction

The vast majority of big issues concerning Europe from now until 2015 will involve the European Union and its evolution into a deeper and wider institution. America's role in Europe during the Cold War was shaped by a division of the continent into two camps, East and West; America's relationship with Europe in 2015 will reflect a continent divided into two new camps, the countries that are members of a prosperous European Union and those that are not.

Absent the unlikely development of a significant military threat, the Euro-Atlantic community epitomized by the US-led NATO alliance will suffer from increasing neglect in 2015 as the members of the European Union focus their energies inward, building an ever closer union among themselves and leaving little in the way of resources and attention to deal with global trends that do not directly affect EU development. The dynamics of the European Union's institutional evolution hold the potential for friction with the United States as EU members struggle to reconcile their own interests and differences in forging common policies.

...what will be the end-state of the European Union?

Defining Europe

An important question shaping the environment of Europe to 2015 is one of ultimate goals: what will be the end-state of the European Union? Will it be a fully integrated super-state where national governments become lost in the shuffle like the individual "states" in the United States, or will it remain something short of that – a combination free trade and currency zone, inchoate military alliance, and assemblage of other institutional and ad hoc arrangements where strong national governments still decide how and to what extent they are going to cooperate with each other? And will the Union remain a well-to-do white Christian club or will it change character by including countries like Turkey, with very different histories and cultures, and Ukraine, with terrible economies and troubled political and social conditions? How far will Europe reach out and what will be the political repercussions of membership exclusion for certain states? Nearly a decade since the breakthrough Maastricht Treaty, the European Union has still to resolve the basic questions deepening and widening – how tightly it must bind its members together in order to be successful and how far it should expand its membership.

Trends in European Integration

Economically the die is essentially cast in favor of greater integration among the existing members of the European Union, but the political and security futures of Europe are more uncertain. What troubles American officials is the prospect that US-European political relations might follow a pattern similar to economic affairs. Since the 1960s EU trade has been centrally managed by the European Commission, with the US government dealing with the Commission as an equal partner – not with individual European governments. The relationship has been rocky: Airbus vs. Boeing, subsidized agriculture, and limitations on Hollywood have a venerable history of conflict. Added in recent years are conflicts over banana imports, hush kits for aircraft, and so called "cultural disputes" like Europe's aversion to hormone-fed beef and genetically altered agricultural products. Such disputes seem never to go away, with endless litigation and public posturing but with rare final solutions; in April 2001, a breakthrough was reached in the "banana war" but interest groups could still scupper the deal. Trade conflict can be expected to continue and possibly increase by 2015, barring an unlikely increase in support for global trade regimes like the WTO or in amity between trade representatives.

Since the Single European Act of 1988, the Europe 1992 project, and the Maastricht Treaty of 1991, other economic issues in the European Union – such as national budgets, environmental and safety regulations, and labor mobility – have become subject to common decisions or at least common scrutiny. This has been a generally successful endeavor for Europe, despite policy disasters like recent outbreaks of deadly disease in farm animals. Integration in the economic sector will deepen as internal barriers continue to fall through further deregulation and business rationalization, leading to an even greater European economic superpower than today. In the late-1990s, the European Union represented about 375 million people with an annual GDP of about $8 trillion and a trade surplus, comparing favorably with the 280 million people, $9 trillion GDP, and enormous trade deficit of the United States. [1]

The European common currency, the Euro, was launched with much fanfare in January 1999 and will be available in notes and coins in January 2002. It has been surprisingly weak, declining by as much as 25% relative to the dollar since its inauguration. [2] 12 of the 15 EU states are in the Euro-zone, with Denmark, Sweden, and the United Kingdom still outside. The Danes rejected the Euro in a 2000 referendum and the Swedes and British are unlikely to adopt it in the near future. The Danish vote has been interpreted by some as a vote against further European integration, which to some means German domination. Yet all three governments retain Euro-zone membership on the agenda and their accession seems likely before 2015, particularly if the Euro strengthens. Its partial recovery as the US economy slowed in 2001 and decisions like Argentina's to shift from a dollar-only currency peg to a blend of dollar and Euro may be the start of a general trend toward true rivalry with the dollar as a world currency, perhaps well before 2015. [3] The United States has enjoyed controlling the world's reserve currency for half a century; reducing this prerogative will constrain US economic policy and activism and change the perception and reality of the United States as the sole superpower.

European governments are reluctant to move forward with dramatic reform to EU structures for fear of losing their own authority...

Institutional Reform

How will the European Union be governed in 2015 and what will be the balance of power between the Union and its member? With 15 members, the European Union

already has trouble with its decision-making structure. The executive body, the Commission, is too large – every country has a post or two – and the Council of Ministers – where real decisions are made – requires unanimous voting on most important issues, giving both Luxembourg and Germany a veto on common action.

European governments are reluctant to move forward with dramatic reform to EU structures for fear of losing their own authority to the Union and, worse, of losing power to another country that did a better job of defending its interests. The current system also suffers from a democratic deficit, with too powerful a bureaucracy and too little meaningful voting by Europe's citizens. Growing regionalism within countries like France and the United Kingdom may also be difficult for the Union and the countries themselves to reconcile. Hence, EU institutional reform is a hot-button issue for politicians sensitive to skeptical populations.

Pending enlargement is driving EU institutional rationalization, however. With an almost doubling in size of the Union likely by 2015, decision-making under current arrangements will be virtually impossible. The EU Nice Summit of December 2000 endorsed the results of a year-long Intergovernmental Conference (IGC), but failed to make dramatic headway in reform. More progress should occur during the next IGC, likely in 2004, with at least 2 or 3 more IGCs likely before 2015. Europe's institutional structure should be defined by then, with streamlined Commission and Council processes and perhaps a European Parliament with real power; national vetoes will likely remain but be rarely used. In 2015, the European Union should be as nimble as, say, the US Congress and civil service! Europe will still be a hybrid with varying degrees of issue-dependent integration, but with increasing social, institutional, and geopolitical imperatives to speak with one voice. Its decisions will come only after complex negotiations between countries and EU bureaucracies – making inputs from external sources difficult to accept and implement. Such a future will have significant repercussions on the United States and its policies.

Enlargement and National Interest

How large should the Union be and what character will it develop? The 15 current members are all reasonably well-to-do, with Greece perhaps the least developed, and have been attached to Western traditions for a long time. Prosperous Norway and Switzerland, while geographically a part of Western Europe, have remained wary of joining the European Union but could do so at any time and would not change its character. The Czech Republic, Hungary, Poland, Slovenia, and Estonia are developing rapidly and are reasonably "Western" countries that may be easy for the Union to digest – although Poland's large agricultural sector is a concern.

But poverty-stricken Bulgaria and Romania will require substantial economic aid should they be allowed to join, and Ukraine's economy and politics are so unreformed that the country is not currently a candidate for accession nor is it likely to be by 2015. Nor are Russia and Belarus, effectively setting the eastern boundary of the European Union. In the Balkans, the overthrow and arrest of Slobodan Milosovic in Serbia has removed some of the impediments to political and economic progress in the region and has significantly increasing the prospects for EU enlargement in Southeast Europe beyond Slovenia.

EU membership for Turkey is an enormously conroversial issue.

EU membership for Turkey is an enormously controversial issue. The country's large population, stumbling economy, Islamic culture, and questionable human rights record make it a difficult country for the current membership to accept. The historic rivalry with EU-member Greece adds a prickly security dimension to the problem. On the other hand, Turkey's recent efforts at reform have warranted a place as a candidate for accession while its strategic position centered between the West, the untamed countries of the former-Soviet Union, and the volatile Middle East, make it a prize too valuable to lose to radicalism or chaos. Much of Turkey's future depends on its own leadership and population, but it seems likely that the country will have a relationship very close to membership with the European Union by 2015. The European Union's commissioner in charge of enlargement, Günter Verheugen, recently visited Ankara and encouraged the country to undertake "additional efforts" to draw nearer to the Union, citing in particular Turkey's failure to renunciation clearly the death penalty and the issue of cultural rights for the Kurdish population. [4]

EU enlargement, particularly to economically needy and culturally divergent accession candidates like Turkey, is causing tremors within the Union's populations. Will the economies of current EU countries suffer from the social welfare costs of new members and will a host of poor people from new members migrate to established and prosperous EU countries? Romania has been described as "a sea of poverty," for example, with vast unemployment, obsolete factories, and subsistence agriculture. Membership means personal mobility within the Union, and some of the current European citizenry are not prepared for significant changes to the composition of their cities and towns. Even without enlargement, illegal immigration – often criminally sponsored – has become an enormous problem for EU countries, with refugees arriving from the Southern Mediterranean, Eastern Europe, and increasingly from remote countries like Afghanistan and China via the Balkans entrepôt. Europe is particularly concerned about the 2 million or so Roma (Gypsies) in Central and Eastern Europe, some who have already fled to Western European capitals and prompted visa restrictions from affected countries. To combat illegal immigration from the East, the European Union is creating a "paper curtain" around the European Union and its accession candidates, restricting access from Russia, Belarus, and Ukraine, and likely harming the economies and furthering instability in those countries. [5]

The participation of Jörg Haider's Freedom Party in Austria's ruling coalition is the most visible political result of anti-foreigner sentiment in Europe. In Denmark the similar Danish People's Party helped to defeat the Euro; in Norway, Sweden, and Belgium, nationalist groups have surged in popularity while in Germany anti-foreigner violence has increased dramatically. All of this is causing European leaders to pause in their enthusiasm for EU enlargement. By 2015, it seems likely that nationalist parties or sentiment will play a greater role in the politics of even the larger European countries, certainly Italy and perhaps France and Germany as well.

Yet immigration may be just what the European Union needs. An aging population in means that both skilled and unskilled positions in industry and service will go unfilled in the future and that further strains will develop in Europe's generous welfare systems.[6] But an American solution allowing substantial immigration, both legal and illegal, will run afoul of Europe's Haiders. To address these issues adequately, the policy focus of EU countries and institutions will be on European domestic issues from now until 2015.

External Relations

Despite its inward bias, Europe will have to deal with the rest of the world. Europe is less connected than the United States to the giant states, dynamic economies, and potential problems of Asia, but will certainly work hard to develop and maintain good economic relations. It has important ties with Latin America and is something of a US political and economic rival in the region, but has no conflicts there that affect its vital interests – even Argentina and the United Kingdom enjoy relatively good relations these days. In sub-Saharan African Europe is more engaged than the United States as a legacy of its colonial past, but again with few vital interests in the region – other than investments and a felt obligation to mitigate civil and tribal violence. Europe will no doubt deploy security forces to central Africa from time to time as it has in the past to protect its nationals, restore order, and perhaps support a favored client. But Europe in 2015 will be much more concerned with what former British foreign secretary Douglas Hurd calls the "arc of danger" to its east and south, stretching from Kaliningrad in the north through Belarus and Ukraine, east to the Caucasus and Caspian, west to the Balkans and the Middle East and along the north African shoreline.[7] Russia, of course, is crucial to what happens in this zone, as is the United States.

Middle East

In the center of the arc of danger is the Middle East. Europe's dependence on oil imports and access to the Suez Canal makes its relationship with this region crucial. The percentage of oil imports from the Middle East may decrease by 2015 as new resources from the Caspian region become available, but Europe will by then be on the wrong side of a seller's energy market as economies like China and India continue to grow and develop ever greater energy appetites.

In part because of its greater need for Middle East oil, Europe has often been less committed to Israel than the United States and more sanguine about allegations that states in the region sponsor terrorism and are developing weapons of mass destruction. This has led to frequent policy disputes with the United States over Middle East policy, with the 1973 Arab-Israeli War and subsequent oil embargo the foremost example. Europe has also sold sensitive equipment and technology to Middle Eastern states identified as "rogue" by the United States and France in particular has contributed to recent weakening of sanctions against Iraq.

By 2015, the Middle East situation is likely to be even more turbulent and dangerous than it is now. Pro-Western states like Saudi Arabia, Egypt, and Pakistan (to extend the Middle East to the Islamic portion of South Asia) could have regime changes bringing to power groups in no mood to work with Europe or the United States and creating substantial political and energy uncertainty. Iraq and/or Iran may have nuclear weapons by 2015 to complement their chemical and biological weapons capabilities; they may also have ballistic missiles capable of reaching the capitals of Europe. This could further decouple US and European security interests, particularly if the United States proceeds with a parochial national missile defense system. On the other hand, the shared dangers of economic turmoil from energy shortages and weapons of mass destruction in the Middle East could drive the US and Europe closer together.

...Europe in 2015 will be much more concerned with...the "arc of danger" to its east and south.

Russia

By 2015 the European Union will have enlarged to include the Czech Republic, Hungary, Poland, Slovakia, the Baltic states of Estonia, Latvia, and Lithuania, Bulgaria, and perhaps Romania – in addition to Slovenia, Malta, and Cyprus. Belarus, Moldova, Russia, and Ukraine will not be members and the union of Russia and Belarus should have occurred by 2005. The European Union will confront the border of Russia itself and will surround the Russian Baltic enclave of Kaliningrad. What issues will arise from this eventuality?

Much will depend on the evolution of Russia's economy and politics and on the policy choices made by Russian leaders. The country is currently poised between East and West and between the developed world and its periphery. Russia's transition from the Soviet era has been difficult, which is not surprising considering its 70 years of centralized control and management. According to University of California scholar Martin Malia, "the Soviet state left behind only administrative and economic rubble, devoid of the judicial accounting and police procedures necessary for a modern society."[8] The whole basis for a democratic and capitalist society must be created, with issues such as ownership, taxation, and legal responsibility still in play. Those that acted quickly and had friends in high places when communism came to an end have done well, as the billions of dollars amassed by the 20 or so Russian oligarchs testify. But cronyism and corruption, identified in the Russian case as *nomenklatura capitalism*, have greatly harmed Russia's people and impeded its transition to a modern state.

Russia now has a GDP less than Switzerland and lurches from political to economic crises and back again with disturbing regularity, surviving in part through IMF and other loans from the West. The financial collapse of 1998, however, had the benefit of reducing the ruble to a more realistic value and stimulating local production. As an energy supplier, Russia has benefited recently from higher energy costs, yet so many structural problems remain that most economists foresee a return to stagnation in the next few years if not months. Hopes of stability and economic reform rest on President Vladimir Putin, as do fears of reduced freedom and increased repression and concerns about arms and technology transfers to states like Iran and Iraq. Russians are also experiencing a demographic crisis because of low birth rate and drastically shortened life-span for its male citizens. The country's depopulation could have profound effects upon its economic and social conditions in 2015.

Europe is committed to helping

Russia join the West. The EU TACIS program alone has invested $300 million primarily to encourage nuclear power plant safety. European business investment and commitment to the country are much greater than the United States, making it tempting to conclude that Russia will be drawn close to the European Union because of mutually beneficial relationships in raw materials, services, and manufactured goods. Russia's long-term prosperity would benefit greatly from a close association with the European Union. On the other hand, Russia's great power pretensions and short-term economic interests may take it to the south and east. There are ready markets for Russian military technology in Iraq and Iran, while China and India are using Russian assistance to move up the ladder of military capability faster than they otherwise might. EU measures to prevent impoverished Russians from heading west and to keep tabs on the virulent Russian mafia are reinforcing the already mentioned paper curtain and will discourage Russian contacts with the West. It is too difficult to tell which trend will be most in evidence by 2015, only that Russian politics and economics will be high on the agenda for European policy makers. Watch for increased investment and perhaps even joint arms production between the European Union and Russia as bell-weathers for more extensive security cooperation and perceived common interests.

From a balance of power perspective, either result will affect the national interests of the United States. Russia going south and east will increase the proliferation of conventional and unconventional arms in regions unfriendly to the United States; Russian instability could require US intervention in far-corners of the world, such as the various 'Stans of south-central Asia – even more remote regions than Somalia, Bosnia, and Kosovo. On the other hand, a close EU-Russia relationship might be good for global stability but would add the human and industrial capital and enormous natural resources of the world's largest country to those of an already powerful European Union. Both results can be mitigated by a vigorous US political and economic presence in Russia.

Transatlantic Relationship

A major question mark for the future is the continued vibrancy of the US-Europe security relationship. The collapses of the Warsaw Pact and the Soviet Union changed the relationships between enemies and friends and has tested the resiliency of Cold War regimes and institutions. Political scientist Stephen Walt wrote that NATO's three unifying forces have either greatly diminished or vanished since the end of the Cold War: first, the Soviet threat; second, America's stake in Europe's economy; and third, the existence of a generation of European and American elites whose personal backgrounds and life experiences left them strongly committed to the idea of an Atlantic community. [9] Alliance solidarity, of course, is not a new concern and has been the subject of countless books over the last 50 years chronicling "the crisis in NATO." But NATO is now clearly a preference, not a necessity, and the crises could be fatal.

Europe's spending on military research and development is much lower than the United States ...revealed vividly in the 1999 Kosovo campaign

Post-Cold War frustration has been growing on both sides of the Atlantic. In the United States, neo-isolationism emerges with each new crisis requiring US military action and may be a trademark of the new Bush administration. The argument goes, "NATO's European members are wealthy, and they will be able to provide for their own conventional defense without American help." [10] The United States demands greater military expenditure from the European members of NATO but is quick to cast a suspicious eye on any project that bolsters European capability apart from NATO. Lord Robertson, Secretary General of NATO, noted that:

> *The US suffers from a sort of schizophrenia. On the one hand, the Americans say, 'you Europeans have got to carry more of the burden.' And then when the Europeans say, 'Okay, we will carry more of the burden,' the Americans say, 'Well, wait a minute, are you trying to tell us to go home?* [11]

On the other side of the Atlantic, "Ameribashing" is increasingly accepted. Books entitled *No Thanks, Uncle Sam*, *The World is not Merchandise*, and *Who is Killing France? The American Strategy* bluntly reflect this anti-American sentiment. *New York Times* reporter Suzanne Daley cited *CSA Opinion* polls that showed 68% of the French were worried about America's superpower status and only 30% found anything admirable about the United States. [12]

Recent Problems

Europeans remain particularly bitter regarding the manner in which the United States handled the Bosnian Peace Process. According to this argument, the United States did not support the largely European Vance-Owen Peace Plan because the United States claimed it did not do enough for the Bosnians. The American-brokered Dayton Accords, on the other hand, were largely successful although many Europeans believe the Bosnians received less than they would have under Vance-Owen. Many Europeans are also increasingly dissatisfied with the manner in which the United States becomes involved in military operations like Bosnia and Kosovo. According to this argument, when the United States gets involved in an multinational operations, it demands to be in charge of the effort but not at the expense of casualties. The United States also restricts American military hardware and technology that can be bought by or transferred to Europeans. Europeans are also concerned about the influence of domestic ethnic interests on US foreign policy, with the pro-Israel lobby a long-standing issue. Extra-territorial laws like the Helms-Burton amendment, attributed to the power of the Cuban exile community in Florida, allow US court action against companies trading with Cuba and have been vigorously opposed by Europe,

These issues contribute to a perception of US unilateralism despite rhetorical multilateralism, and to a belief in American overemphasis on military means while forgoing greater diplomacy and other non-violent means of dispute resolution. Foreign minister Hubert Vedrine of France coined the term "hyperpower" to describe the current place of the United States in the world, and questioned whether it was a very healthy situation. Several issues are testing the transatlantic relationship, but defense budgets and defense industry consolidation, national missile defense, and Europe's plans for autonomous security and defense will require the most attention to

prevent a breach in the alliance.

Spending and Technology

With the exception of Britain, France, and Greece, the members of the European Union spend much less as a percentage of GDP on defense than the United States – below 2% in most cases. And what they spend it on does not contribute very well to allied capabilities, concentrating on mass armies that are of little use against the threats of the 21st century. According the Rand Strategic Assessment, about 80 percent of European forces conduct territorial defense at medium readiness. The remaining are high-readiness, reaction forces totaling 10 divisions, 470 combat aircraft, and 160 ships that are mostly tailored for local missions. [13]

Europe's spending on military research and development is much lower than the United States, a "technology gap" revealed vividly in the 1999 Kosovo campaign. 80% of the air strikes were American and most of the high tech command and control was American as well. Europe also lacks airborne ground surveillance capability, heavy lift, long range cruise missiles, and comprehensive reconnaissance satellite coverage. As a singular example, the United States has 10 times the airborne tankers of Europe. [14] NATO's Defense Capabilities Initiative (DCI) is designed to identify and help remedy some of these problems; the European security and defense policy discussed below also has greater capability as a goal. The gap will not be closed by 2015 although some progress may be made, such as several European countries acquiring the Airbus A400 transport for strategic lift. Because of the extremely large expenditures needed to develop modern weapons systems, Europe has been slowly moving toward defense consolidation across national borders, a trend that should facilitate better use of assets and contribute to greater capability.

This again will cut two ways. Greater and smarter defense expenditures will enhance the ability of Europe and the United States to remain partners in defense; the down side will be the tendency to procure exclusively from European industry. Part of the reason for consolidation is to compete better with a US military industry that has gone through its own consolidation since the end of the Cold War – leaving giants like Boeing and Lockheed in control of enormous research and production capability. The United States usually buys American and Europeans will buy European, setting the stage for further trade conflict and possible interoperability problems in NATO. In 2000, the United Kingdom ordered the Airbus A400 instead of C-17s and C-130s and Meteor missiles from a European consortium instead of AMRAAMs from Raytheon – in part due to the appeal of European solidarity. Further and perhaps even more dramatic examples of local preference in European weapons acquisition are likely by 2015. Some believe that defense industry consolidation is the key to developing a really functional common European security and defense policy.

National Missile Defense

In July 1999, President Clinton signed the National Missile Defense Act of 1999 which committed the United States to deploying an "effective National Missile Defense system [NMD] capable of defending the territory of the United States against limited ballistic missile attack" as soon as technologically possible. [15] After a string of test failures, he deferred a deployment decision to the next administration. President Bush and his top officials, particularly Defense Secretary Donald Rumsfeld, are enthusiastic proponents of NMD and seem likely to receive vigorous support from much of Congress.

Some believe that defense industry consolidation is the key to developing a really functional common European security and defense policy.

Europe is concerned that the United States will bolster its own defense without concern for its European allies and will abrogate the 1972 Anti-Ballistic Missile (ABM) Treaty, perhaps rekindling an arms race with Russia and/or China. At their July 2000 summit, Russian President Vladimir Putin and Chinese President Jiang Zemin issued a joint statement that "implementing this plan [NMD] will have the most grave adverse consequences not only to the national security of Russia, China, and other countries, but also to the security and international strategic ability of the US itself." [16] Vladimir Yakovlev, commander in chief of Russia's Strategic Rocket Forces, said Russia might even withdraw from the INF Treaty and resume the manufacture of medium-range missiles if the United States proceeded with NMD. [17] Many believe the Chinese reaction will be most important, with qualitative and quantitative improvements to its strategic nuclear arsenal and perhaps accelerated sales of sensitive equipment and technology to rogue states.

Europeans are also coming to the belief that their opinions do not matter much in Washington and that a deployment decision will be made regardless of their concerns, a path already taken with the Comprehensive Test Ban Treaty (CTBT). In 1999, British Prime Minister Tony Blair, French President Jacques Chirac, and German Chancellor Gerhard Schroeder wrote a letter to the *New York Times* stating that rejection of the CTBT "would also expose a fundamental divergence within NATO." [18] In spite of these appeals and support from President Clinton, the US Senate rejected the treaty, particularly telling since the Russian Duma subsequently ratified it. President George W. Bush is on record as supporting the Senate rejection.

National missile defense is an issue that can alter geopolitics. While a case can certainly be made for such a system, it is presented by US officials as the only possible option to counter the proliferation of long range ballistic missiles and the weapons that go along with them. Other issues should be considered, including the well-known "security dilemma" where the actions taken to increase a country's security may actually reduce it because of the reaction it stimulates in others. The United States is gaining a reputation for cavalier treatment of friends and foes alike, reflected in US diplomat Richard Holbrook's disinterest in Russian reaction to NATO enlargement – stating abruptly that "they'll get over it." NMD is divisive and is likely to cause tense relations between Europe and the United States in the coming years. Yet by 2015, particularly if conditions in the Middle East and/or South Asia deteriorate, Europe may well have accepted the US NMD initiative and become a part of it. [19]

Common European Security and Defense Policy

Europe could distance itself from the United States through the development of its own

security and defense apparatus.[20] Although the evolution of the EU common foreign and security policy (CFSP) and European security and defense identity (ESDI) has been set in terms of strengthening the transatlantic relationship, it is fraught with tension between a suspicious United States and an assertive though often uncertain European Union.[21] This included the alleged but infamous "letter of rebuke" to several European countries in 1991 that hinted at US withdrawal from Europe should CFSP develop in a way considered unacceptable to US interests.[22] The EU's CFSP was nonetheless approved at Maastricht and came into force on 1 November 1993, with a permanent secretariat to assist the Council of Ministers in negotiations and procedures for collective decision-making. The October 1997 Amsterdam Treaty (put into force on 1 May 1999) strengthened CFSP by stipulating that the Council of Ministers could decide on some security issues by qualified majority vote, subject to appeal based on important national interests. Amsterdam also created the position of High Representative for the Common Foreign and Security Policy, the General Secretariat of the Council, and the Policy Planning and Early Warning Unit (PPU), all designed to help formulate and implement the political decisions of the Council of Ministers.

Maastricht included an EU connection to the Western European Union (WEU) alliance, which was also pursuing a strengthening of mission. In 1992, WEU members adopted the Petersberg Declaration listing the types of missions the WEU might pursue on its own (i.e., without NATO and the United States), such as humanitarian and rescue operations, peacekeeping, and combat forces in crisis management – including peacemaking.[23] In 1996 at Berlin, NATO leaders approved the Petersberg tasks as appropriate for the WEU and offered the possibility of using NATO staff and equipment. Policies and procedures like the Combined Joint Task Forces (CJTF) were developed to facilitate autonomous WEU operations.[24] CJTF would enable Europe to conduct operations that were not a high priority for the United States while avoiding duplicate force structures and equipment, and would also allow associate countries (non-members of NATO, the WEU, or the European Union) to participate in Europe-led operations.

But the WEU lacked the popular appeal and deep roots of the European Union and never received more than token support from the leading European countries. The NATO-WEU rubric began to break down with an initiative by the most NATO-friendly of countries. In December 1998 at St. Malo, France, Prime Minister Tony Blair of Great Britain, along with President Jacques Chirac of France, issued a declaration on European defense that cleared the way for EU defense development. They wanted the European Union to be able to launch military operations without the United States in the lead, as seemed necessary in Bosnia in 1995. This was a sharp departure from the previous British reluctance to associate the European Union with defense and military matters.

Europe's poor performance in Kosovo in spring 1999 encouraged EU leaders to follow up the St. Malo initiative at Cologne in June 1999. They stated their intent "to give the European Union the necessary means and capabilities to assume its responsibilities regarding a common European policy on security and defense." This included preparing for the "inclusion of those functions of the WEU which will be necessary for the EU to fulfill its new responsibilities in the area of the Petersberg tasks." The European Union took over WEU duties at the end of 2000 and the WEU was dissolved.[25]

These initiatives took on the new acronym CESDP (common European security and defense policy) and continued development at the EU Helsinki summit of 10-11 December 1999. EU leaders decided that "cooperating voluntarily in EU-led operations, Member States must be able, by 2003, to deploy within 60 days and sustain for at least 1 year military forces of up to 50,000-60,000 persons capable of the full range of Petersberg tasks."[26] They also committed to new political and military bodies to direct the operations, to develop cooperation and transparency with NATO, to define arrangements with non-EU European NATO members, and to establish non-military crisis management mechanisms.[27] These were all part of the so-called EU Headline Goals for 2003. In November 2000, EU members and other countries made formal troop and equipment commitments to the rapid reaction force.

US opinion on autonomous European security and defense has been "fiercely ambivalent," according to Paul Cornish of Kings College, while British sources note that the current EU-NATO negotiations are driving the Americans "nuts." And this is because, at a very profound level, the development of the European security and defense policy is likely to be the beginning of the end of NATO. All except France forswear such a motive, but the internal and external dynamics for CESDP to develop as a military alliance are in place. It will take some time for the agreements of Helsinki to be transformed into actual capability, yet easy to visualize a Europe in 2015 with its own military force and some successful peacekeeping operations under its belt occasionally rejecting US involvement and all the baggage that comes with it.

ESDP is a logical follow-on to the EU's economic, financial, social, and political cooperation. By 2015, NATO could regress to a mere talking shop, a place where the United States and EU alliance coordinate activities on a grand scale but no longer a functional collective defense organization. This may be sufficient to manage regional security issues, but a far cry from the powerful alliance NATO once was. NATO has been a metaphor for US-Europe cooperation and the vehicle for US military and political influence in Europe; its demise would be represent a significant American loss in an important part of the world.

A European Nuclear Force?

Will the European Union develop a nuclear component to its common European security and defense policy? It might want one to help maintain its place among the world's great powers following the nuclear weapons tests of India and Pakistan and the changes to the international structure the tests imply. European politics might also desire a nuclear ESDP if their interests diverge substantially from those of the United States, their primary nuclear protector, or if they lose faith in the US/NATO commitment to their defense. Without the unity inspired by a common threat from the Soviet Union, issues like trade, defense burden sharing, and environmental policy could lead to serious disputes. The US quest for a National Missile Defense system and the EU's own defense initiatives might

presage a European military alliance that may "someday need a single nuclear power to speak as a deterrent force for [the] whole continent," as French Foreign Minister Hubert Vedrine noted in July 2000. And it would not be very difficult to do operationally, pooling the British and French submarine-based nuclear deterrent forces into a European nuclear capability that would receive doctrinal and operational guidelines for an EU version of the NATO Nuclear Planning Group.

The difficulty, of course, is political. Powerful counter-tendencies make a nuclear ESDP anytime soon improbable. The European Union enjoys considerable power, prestige, and security without the responsibility and opprobrium of a collective nuclear force. Most Europeans see no need for a nuclear CESDP, including residents of the United Kingdom and France where national nuclear weapons provide part of their deterrent protection and most of their great power status. Passions against nuclear energy in any form have a home in European political parties, like the German Greens, that now occupy positions of power. And, as a French defense paper points out, there will not likely be a European nuclear doctrine without European vital interests, and these are inchoate at best. Europe is unlikely to have a common nuclear force by 2015, but discussions on the topic will be more frequent and more urgent.

Arms Control and Proliferation

Europe has been a vigorous backer of arms control regimes. Although the arms control agreements of the Cold War were primarily between the United States and Soviet Union, Europe supported them as means to reduce tension and the likelihood of war. As a group, European nations have helped strengthen the Nonproliferation Treaty and other portions of the nonproliferation regime, including the Nuclear Supplier Group agreements, Biological and Chemical Weapons Conventions, and the Missile Technology Control Regime. Europe's nuclear safety initiatives are helping to stabilize dangerous environmental and potential proliferation hazards in the former Soviet bloc. Although France and Great Britain were noticeably lenient in sanctions placed on India and Pakistan for testing nuclear weapons and, too frequently, European suppliers have been enthusiastic about selling sensitive material to rogue states, Europe in 2015 is likely to remain an enthusiastic supporters of efforts to prevent the proliferation of weapons of mass destruction.

Conclusion

Europe 2015 is not set in stone. Choices made by the United States, Russia, and other countries, not to mention the Europeans themselves, will profoundly affect the shape of Europe in the future. This is particularly true since traditional military threats to the region are absent and other threats – such as from mass migration, civil disorder, economic collapse, and environmental degradation – are relatively new to the security realm and much harder to defend against by normal means. The recent US withdrawal from the Kyoto Protocol on CO2 emissions and the new EU visa regime with Eastern Europe, for example, could both become security issues in some way. The European Union is beginning to act more like a coherent political entity and the United States will just have to deal with the situation as best it can. Europe has the people, resources, and organization to become a true rival to the United States. And at some point, probably before 2015, consideration will be given on both sides of the Atlantic to reducing further the number of US bases in Europe.

Europe has the people, resources, and organization to become a true rival to the United States.

> But unless US leaders are grossly incompetent – particularly in their management of missile defense initiatives – the Union will not develop into a military superpower by 2015. Such a transition would cost a great deal to do so, require much more political consolidation in the region than now seems likely, and go against a non-military self-image among Europeans, perhaps post-modern, in the conduct of their affairs. Europeans (with perhaps the French excepted) are comfortable and not imperial, reactive and not assertive, and used to following the US lead. And this may suit the times, making Europe a force for restraint and non-military options to conflict – even a force for peace. And despite the potential for great power rivalry in several issue areas, as Robert Blackwill pointed out, neither the United States nor Europe threatens the vital interests of the other side. In 2015, the marriage is likely to remain successful if not always happy.

(Endnotes)

[1] *Strategic Assessment 1999* and *CIA Factbook*.

[2] "The Darling Dollar," *The Economist*, 7 April 2001.

[3] *New York Times*, 12 April 2001.

[4]"" *Süddeutsche Zeitung,* 27 March 2001.

[5]'s Strategic Engagement with Ukraine," presented at the International Studies Association Annual Conference, March 2000, Los Angeles, CA.

[6] "Global Trends 2015: A Dialogue About the Future With Nongovernmental Experts," NIC 2000-02, December 2000, prepared under the direction of the National Intelligence Council.

[7] *Financial Times*, 28 March 2001.

[8] *New York Times*, 3 September 1999.

[9] Stephen M. Walt, "The Ties That Fray: Why Europe and America are Drifting Apart," *The National Interest*, Winter 1998/99, 3.

[10] Charles Eugene Gholz, Daryl G. Press, and Harvey M. Sapolsky, *Come Home America: A Military Strategy for the 21st Century*, 218.

[11] Dr. Guenther Burghardt, "European Security: Past, Present and Future," speech at the Friedrich Ebert Stiftung Seminar, Washington, DC, 15 March 2000, .

[12] *Denver Post*, April 9, 2000, 26A.

[13] *Strategic Assessment 1999*, 83.

[14] See David Yost, "The NATO Capabilities Gap and the European Union," *Survival*, Vol. 42, No. 4, Winter 2000-01.

[15] U.S. Public Law 106-38. .

[16] *Financial Times*, 18 July 2000.

[17] Sharon LaFraniere, "Russian Threatens Action Over U.S. Missile Plan," *Washington Post Foreign Service*, June 23, 2000, .

[18] Jacques Chirac, Tony Blair, and Gerhard Schrõder, "A Treaty We All Need," *Britain in the USA*, , 8 Oct 99.

[19]'s Fundamental Divergence Over Proliferation," *The Journal of Strategic Studies*, Vol. 23, No. 3, Sept 2000, who argues that Europeans need to accept the US position on NMD because arms control policy for the past decade has been a failure.

[20] See "In Defence of European Defence: An American Perspective" by Charles A. Kupchan, *Survival*'s need for force projection capability to be able to manage properly its security affairs and that a reassessment of the transatlantic bargain is taking place.

[21] "Global Trends 2015: A Dialogue About the Future With Nongovernmental Experts," NIC 2000-02, December 2000, prepared under the direction of the National Intelligence Council.

[22] Charles Krupnick, "Not What They Wanted," *Disconcerted Europe: The Search for a New Security Architecture*, Alexander Moens and Christopher Anstis, eds. (Boulder: Westview Press, 1994), 124-5.

[23] Petersberg Declaration, 19 June 1992, Part II, Paragraph 4. Cited from *Towards a Common Defence Policy*, Laurence Martin and John Roper, eds. (Alençon, France: Institute for Security Studies of WEU, 1995), 9.

[24] For the development of EU security cooperation up to 1996, see Charles Krupnick, "Europe Without the United States?: Prospects for European Defense Cooperation after the 1996 European Union Intergovernmental Conference," *Airpower Journal*, Special Edition 1996, 48-58.

[25] "Presidency Conclusions: Cologne European Council, 3 and 4 June 1999, European Council Declaration on Strengthening the Common European Policy on Security and Defense."

[26] "Presidency Conclusions: Helsinki European Council, 10 and 11 December 1999."

[27] "European Security and Defense Policy," in "European Union: Policies & Legislation" at http://www.eurunion.org/legislat/Defense/espweb.htm.

PROLIFERATION DRIVERS IN THE MIDDLE EAST

Overview: The Middle East region contains many of the world's greatest proliferators. It is home to the largest concentration of states spending a large portion of GDP's on defense. It is a territory prone to conflict, and one in which states have purposely used chemical weapons against each other, and in the case of Iraq, one in which a state used such weapons against an ethnic group within its own borders. It is also habitat to the likes of Saddam Hussein, Muhammar Qaddaffi, and the former Ayatollah Khomeni, leaders who at one time or another declared themselves as enemies of the United States. Each was determined to gain/maintain regional hegemony by developing weapons of mass destruction (WMD). They and others like them antagonized neighbors and induced instability in the region. Why then, is this such an unstable region? How does instability contribute to proliferation and what drives it? It is the purpose of our analysis to begin to answer these questions as they relate to predicted capabilities in the region during the next 15 years.

First, a note about our research team. It includes four members of the Political Science Department of the United States Air Force Academy. Dr Barbara Presgrove is a State Department visiting scholar, having previously served in the US embassy in Cairo. Major Brent Talbot currently serves as the Deputy Director for INSS and is an adjunct Assistant Professor who specializes in Middle East politics and US national security affairs. Captains Troy Thomas and Tim Uecker, both Instructors in the department, previously served as Intelligence officers in the Middle East. Thus, we bring a diverse background to the subject area.

In order to fully analyze the world of 2015 as it will exist in the Middle Eastern region, our team decided upon a novel approach. Rather than review and summarize other studies predicting the future of the region, we decided to brainstorm a list of all the probable reasons why state and non-state actors in the region might proliferate during the next 15 years. Our original list included over 66 reasons, or what we labeled as 'proliferation drivers.' We then decided upon seven general categories under which these various drivers could be grouped. We then divided the Middle East into four sub-regions so that we could each provide a more detailed analysis of drivers and actors in each of the sub-regions after reviewing the literature and applying our own knowledge bases to the analysis. These were scrutinized during a series of meetings where we met and compared notes. Our analysis is summarized in Table 1 (see page 3) and includes a rank ordering of the actors based upon drivers. The more drivers that affect an actor, the more likely it is to proliferate. Thus, those actors at the top of the chart are the ones that should be of greatest concern to the United States. Moreover, we also added a capabilities analysis by making an effort to predict the types of weapons that each would likely pursue depending on its capabilities and the rationale driving proliferation efforts. It should be understood that the drivers we identified might also be used to measure instability and the likelihood of conflict in addition to the bias toward proliferation.

...home to the largest concentration of states spending a large portion of GDP's on defense.

The body of the report is organized into 4 sections: I) Actors, II) Drivers, III) Weapons, and IV) Threat Scenarios. Each section (except the last) includes definition and analysis subdivisions. The actors section includes both state and non-state actors and summarizes concerns related to actors primarily at the top of our analysis chart (Table 1). Section II is the meat of our report and explains each of our categories of drivers and describes why they affect the major actors of concern as well as other potential actors that could become obstacles to US policy. By understanding the drivers, it is also hoped that policymakers may be enabled to actually find solutions to the problems behind proliferation. By eliminating the drivers, the reasons for proliferation and conflict might also be reduced, which in turn, could attenuate the threat to US interests in the region. Thus, understanding the drivers is key to countering them and developing the best policy for the Middle East. Section III is included in order to illuminate the most dangerous threats. Actors with the most drivers are not always the most capable, and therefore, may not evoke the level of concern that those with WMD capability or advanced conventional weapons might provoke. Finally, we thought we should spell out the most likely threat scenarios as well as wild card scenarios that should be of utmost concern to policy-makers when determining which types of arms control and non/counterproliferation policies might apply to the region. Indeed, these scenarios are likely to be a catalyst for rapid proliferation or sudden changes in acquisition and development strategies.

ACTORS

Definition: Actors are both state and non-state entities that are capable of proliferation and deemed as those having a probable inclination to do so. For our purposes, the actors in this analysis are limited to the Levant-Arabian peninsula and the North Africa coastal region, which regions comprise most of the existing Arab states, plus the non-Arab central Asian states of Afghanistan and Iran, and internal or regional non-state entities comprising the same territory. All possible actors are not included because the study group focused on probable rather than possible actors.

Probable actors are those deemed most likely to proliferate during the next 15 years (2001-2015). One should also realize that our emphasis is on drivers (as defined in the next section) and is therefore suggestive of other important actors emerging in the future, such as MNCs and/or terrorist networks that do not currently exist, or are too new to be of any consequence at present. In those circumstances, the cur-

1. **State Actors**: Legal state entities in the Middle Eastern region defined above that are administered by legal sovereign governments. They include the following states: Morocco, Algeria, Tunisia, Libya, Egypt, Israel, Jordan, Lebanon, Syria, Iraq, Saudi Arabia, Kuwait, Bahrain, Qatar, United Arab Emirates, Oman, Yemen, Iran and Afghanistan. Turkey was not included because it falls under NATO and the European analysis (although we mention it briefly). Other Central Asian states in the Caspian Sea basin fall under the analysis of the Russia group as former Soviet Republics. And other African-Arab states (such as Sudan, Djibouti, and Somalia) are included in the Africa analysis section.

2. **Non-state Actors:** All internal or transnational active groups other than

Table 1.

Proliferation Drivers in the Middle East Actors (State and Non-State) Ranked by Drivers and Weapons Capabilities	***Drivers*** R = Resource/Environmental S = Socio-Economic L = Leadership/Regime Control I = Indigenous Factions D = Defense/Deterrence O = Offense/Coercion E = External Relations	***Weapons*** C = Conventional A = Advanced Conv M = Adv Conv Missiles W = Bio/Chem WMD N = Nuclear WMD
Actors	**Drivers**	**Weapons**
1. Israel	R, S, L, I, D, O, E	C, A, M, W, N
2. Iran	R, S, L, I, D, O, E	C, A, M, W, N
3. Iraq	R, S, L, I, D, O, E	C, A, M, W, N
4. Syria	R, S, L, I, D, O, E	C, A, M, W
5. Palestine/PLO/PNA	R, S, L, I, D, O, E	C, W
6. Egypt	R, S, L, I, D, E	C, A, M, W (N if regime change)
7. Iraqi Opposition (INC/Families)	R, S, I, D, O, E	C, A
8. Jordan	R, S, L, I, D, E	C, A
9. Kurds	R, S, I, D, O, E	C, W
10 Libya	S, L, D, O, E	C, A, M, W, N
11. Saudi Arabia	R, L, I, D, E	C, A, M
12. Yemen	R, S, L, I, D	C, A, W, M
13. UAE	R, L, I, D, E	C, A
14. Mujahhadin e-Khalq (Iranian Opposition)	S, I, D, O, E	C, A
15. Bahrain	R, S, L, I, D	C, A
16. Saudi Shi'a	S, I, D, O, E	C, W
17. Kuwait	R, L, D, E	C, A
18. Tunisia	S, L, D, E	C, A
19. Algeria	S, L, I, D	C, A (W, N if regime change)
20. Hamas/Extremists (Palestine)	S, D, O, E	C, W
21. Hizbollah (Lebanon)	S, D, O, E	C, W
22. Qatar	R, S, L, D	C
23. Marsh Arabs (Iraqi Shi'a)	R, S, I, D	C
24. Bahraini Shi'a	S, I, D, E	C
25. GCC	R, D, E	C, A, M
26. Taliban (Afghanistan)	S, I, O	C, A, W
27. ARAMCO/Other MNC	R, S, D	C, A
28. Algerian Islamic extremists	S, I, O	C
29. Lebanon	S, I, E	C
30. Jewish Settlers/Extremists	R, I, O	C
31. Egyptian Islamic extremists	S, I, O	C
32. Oman	R, D, E	C
33. Azeri Ethno-political Group (Iran)	S, I, E	C
34. Morocco	D, E	C, A
35. Tuareg (border ethnic group-Algeria)	S, I	C
36. Arab League	E	C
37. OPEC	R	C

states, which include ethnic groups without sovereignty that desire such, political groups out of power, international governmental organizations (IGOs) that seek to bring states together for economic or military purposes, and MNCs or other non-governmental organizations seeking the same, which are usually more resource driven (such as OPEC or ARAMCO).

Potential Examples: Palestine is represented in our analysis as both a quasi-government entity (PLO--Palestine Liberation Organization /PNA--Palestinian National Authority) and as an ethnic unit fighting for independence and/or control of the government (Hamas/Extremists). Hamas has repeatedly acted beyond the control of PLO/PNA Chairman Yasir Arafat and must thus be viewed as a separate entity that could be driven to proliferate in both opposition to Israel and to an established and sovereign Palestinian state government controlled by the PNA.

Analysis: Weapons proliferation is a major problem of concern in the Middle East. Actors in the region make up six of the top nine states worldwide spending the greatest share of GDP on defense, according to the International Institute for Strategic Studies annual report (see table 2). Moreover, Anthony Cordesman, a leading expert on Middle East proliferation, claims that this is a region where the reasons for prolif-

erating often outweigh the perceived risks. The lessons from the Iran-Iraq War and the Gulf War make it clear to many states in the region that missiles and chem/bio weapons are likely to be used and therefore must be developed as a deterrent, or at least one must posses the advanced conventional weapons that are capable of deterring and repelling WMD attacks. It is a region of unstable rivalries and arms races: Egypt-Israel-Syria, Iran-Iraq-Southern Gulf states; it is a region where it is difficult to predict the future behavior of one's neighbors, and one in which state, proxy, even private terrorism finds sponsorship.[1] Thus, the Middle East will remain a region where state and non-state actors must continually be watched for signs of proliferation, and where US policy to counter proliferation remains a necessary part of providing security in the region.

As our own analysis will show, the number of probable proliferators or 'actors' identified in this study (37) shows that the Middle East must remain of utmost concern to US foreign policy-makers (see Table 1 for the complete list of actors). Our 'drivers' analysis identifies seven major reasons that drive Middle Eastern state and non-state actors towards proliferation (see section II). Five of the region's actors are driven by all 7 of them; an additional four actors are driven by 6 of 7, and another six are affected by 5 of the 7 drivers. In sum, this means that at least the top15 actors should be of great concern to US policy-makers and a focus of intelligence efforts, and 33 of the 37 (having three or more drivers) should be closely watched during the next 15 years for signs of proliferation, especially those showing up as WMD proliferators (see weapons column in Table 1). Of the top 15, five are likely to seek nuclear weapons, eight are likely to seek chem/bio weapons, and all but three are likely to buy/build or already posses advanced conventional weapons (see section III for a more detailed weapons analysis).

Table 2.
States Spending Greatest Percent of GDP on Defense[2]

1. Eritrea	35.8%	6. Kuwait	12.9%
2. Saudi Arabia	15.7%	7. Qatar	12.0%
3. Afghanistan	14.5%	8. Angola	11.7%
4. North Korea	14.3%	9. Israel	11.6%
5. Oman	13.6%		

Those actors topping the list (with all 7 drivers) include Israel, Iran, Iraq, Syria, and the PLO/PNA (Palestine quasi-government). All have been or are currently involved in conflict during the past decade and the number of drivers would indicate that all are likely to be involved again. Current US policy is focused on these states (or incipient states) of the region. The US has actively pursued a peace treaty between Israel and the PNA (to include statehood for Palestine). The Clinton administration Dual Containment policy focused on Iraq-Iran in an effort to curb proliferation in those states; and efforts to bring Syria into bilateral negotiations with Israel have also been high on the agenda of the last two presidential administrations. Thus, past US policy has been rightly focused on the major states of concern and efforts should continue in this direction. Achieving success in the Arab-Israeli peace process would go a long way toward curbing violence and proliferation among these critical states of the region. Moreover, it would take away drivers for non-state actors that are among the most likely WMD proliferators, namely, Hamas and Hizbollah.

The second group of actors: Egypt, Iraqi opposition, Jordan, and the Kurds (with 6 of 7 drivers), reveals actors that have not been a major focus of US policy. While both Egypt and Jordan benefit significantly from US relations and are considered deeply entrenched in the US camp, the Kurds and the Iraqi opposition receive only minor support from the government. The high number of drivers influencing both groups would indicate likelihood for stepped-up levels of violence in the future as they seek independence or other outlets to vent political frustrations. For Iraq, this means continued opposition to Saddam's regime. US policy during the past administration was aimed at overthrowing Saddam and congressional support included a bill that funded the Iraqi opposition. Still, with the opposition weakened and divided due to regime efforts to suppress it as well as internal disputes between opposition groups, there has been little chance of the opposition gaining enough strength to overthrow Saddam. The same applies for Iraqi Kurds. Divisions between Iraqi Kurdish groups let alone between Iranian, Syrian and Turkish Kurds make it most difficult for any kind of unifying cause to unite them and allow success through increased numbers. Still, the large number of drivers is an indication that proliferation efforts and violence will continue among them and against the anti-Kurdish governments of the region.

One of the key concerns of this region is the number and proximity of antagonistic actors that may be provoked to attack one another. Major uncertainties that arise due to this proximity include: Who is the enemy and who is the ally (consider Jordan's role vis-a-vis the coalition during the Gulf War)? If an attack occurs, will it be possible to determine which actor launched it, especially if it is a non-state actor using terrorist tactics (consider the 2000 terrorist attack on the USS Cole in the port of Aden)? Does the US presence in the region contribute to security, or influence actors in a negative way (induce additional drivers)? The type of governments is also a concern. Most are authoritarian leaders who may not understand the full effects of advanced technology and WMD weapons. Should such a leader have possession of WMD weapons during a crisis, how will he react? Will he fully understand the consequences of his actions?

The next section of the paper will focus on the drivers themselves and give more insight into the rationale behind proliferation in the Middle East.

DRIVERS

Definition: forces and/or factors impacting on a state or non-actor in a manner that encourages weapons proliferation; core incentives for developing and acquiring weapons. For a driver to be linked to an actor, it must be assessed as a probable catalyst for weapons proliferation. To increase utility and deliver focus, all potential drivers have been aligned under the seven core drivers provided here. Drivers are generally interrelated, reinforcing and modifying the others. Drivers have global relevance. Armed with an understanding of the motivations for regional weapons proliferation, policy-makers can focus resources and energies on reducing or eliminating the incentives for proliferation.

1. Resource/Environmental: Weapons proliferation manifesting from a need to protect and/or control resources and/or the environment. Factors include among others water, arable land, oil, minerals, strategic geography, pollution, deforestation, and lines of communications. Resources/environmental forces are a salient driver if it can be assessed that the actor is probably motivated to acquire weapons as a means to protect or gain access to a resource and/or enter a dispute with another actor over resource use and/or environmental effects. For state actors, resource issues often involve disagreements with other states over access or use of vital resources. States may also see weapons as necessary protect resources from indigenous factions. Non-state actors are often motivated by a desire to gain access to resources restricted by states. Weapons are also acquired for use in disrupting state control of resources as part of a broader opposition strategy.

Potential Examples: Egypt acquires an air refueling capability to enable offensive operations against Sudan resulting from Sudan's restriction of the Nile flow. The Mujahhadin e-Khalq (MEK) attack Iranian oil facilities as part of a broader campaign to dislodge the current regime.

2. Socio-economic: Weapons proliferation resulting from social and economic factors. Social tensions and economic disparities can lead actors to seek weapons as a means to survive in the context of a failed state or society, redress grievances through the use of violence, exact revenge for perceived or actual oppression/aggression, or change the status quo. Socio-economic forces include a "youth explosion" with regard to overall population, which can lead to high levels of unemployment and un-realized expectations. Disaffected youth, particularly in the developing world, are prone to militant or extremist influences. Displaced persons are another source of socio-economic tension. Rapid urbanization combined with poverty creates conditions ripe for violence from state and non-state actors. Socio-economic forces are salient if it can be assessed that the actor is probably motivated to acquire weapons as result of tensions and/or unrest created by social dynamics and economic factors. For state actors, socio-economic forces can often generate a need for military forces capable of exerting control over the population, preventing state disintegration, or protecting resources and high-value assets. Non-state actors are the most effected by socio-economic conditions, which often lead individuals and groups to seek weapons for the reasons outlined.

Potential Example: Persistent high unemployment levels in Iran lead to increasing social unrest as disenfranchised students take up arms against the regime, and the regime acquires armored personnel carriers to support urban population control operations.

3. Leadership/Regime Control: Weapons proliferation intended to enable leadership to exert control over the regime through coercion, accommodation, cooptation, intimidation or competition. Prestige and reputation also figured in to weapons acquisition efforts, particularly if regional status is correlated to the size of one's military or the sophistication of weapons technology. Leadership/regime control is a salient driver if it can be assessed that the actor is probably motivated to acquire weapons as a means to maintain power or enhance perceptions of power domestically, regionally and internationally. For state and non-state actors, weapons are often necessary to ensure balance among military organizations, particularly when the competition is manipulated to prevent any one organization from threatening the regime while also maintaining a sufficient force to deter foreign aggression. Weapons development and acquisition may also result from the need to accommodate or co-opt factions within the regime.

Disaffected youth...are prone to militant or extremist influences.

Potential Example: The United Arab Emirates acquires more advanced fighter aircraft than demanded by the threat in order to ensure the dominant Emirates of Dubai and Abu Dubai have a rough balance in capabilities.

4. Indigenous Factions: Weapons proliferation manifesting from a challenge posed to the state from a non-state actor, such as an ethno-political group, a religious movement, an multi-national corporation, or an ideological party (among others). An indigenous faction is a salient driver if it can be assessed that the non-state actor is probably motivated to acquire weapons as a means to challenging the state or that the state is motivated as a means to countering the real or imagined non-state challenge. For state actors, indigenous factions include those groups that are not part of current leadership or regime. State motivations are wide-ranging and may include perceptions of a potential threat to regime control or stability. Racism, intolerance and hate should not be minimized as influential factors. For non-state actors, such as an ethno-political group, this driver is applicable if the group has achieved some degree of self-identification, loyalty from its members, and has or will undertake efforts to challenge the regime. This challenge may be limited to seeking greater autonomy or political representation. It may also include complete subversion and toppling of an existing regime.

Potential Example: The Egyptian government acquires advanced conventional weapons to counter an increasingly aggressive challenge from Islamist extremists such as the Gamat al-Ismaliyya, which is using chemical agents to disrupt tourism near Luxor.

5. Defense/Deterrence: Weapons proliferation intended to enable an actor to deter aggression and defend against perceived or actual threats. Defense/deterrence is a salient driver if it can be assessed that the actor is probably motivated to acquire weapons due to the current or future existence of a threat. For state actors, defense/deterrence often manifests from concerns over the hostile intentions of another state or group of states, or from concerns over indigenous challenges. Non-state actors can be motivated to seek weapons for defense/deterrence as a result of a threat from other non-state actors or more likely, from a state that it perceives as hostile to its activities or even existence.

Potential Examples: Kuwait acquiring advanced fighters to defend its airspace against an Iraqi incursion. Iraqi Marsh Arabs (Shi'a) acquiring conventional weapons to defend against government destruction of homes in Southern Iraqi towns.

6. Offense/Coercion: Weapons proliferation intended to enable an actor to conduct offensive military action against another actor or use its weapons as a means

to coerce or compel. Offense/coercion is a salient driver if it can be assessed that the actor is probably motivated to acquire weapons as a means to intimidate and/or attack for non-defensive reasons. For state actors, offense/coercion is often a salient driver if it has interests beyond its borders. This driver is also relevant if the state has aggressive or hostile intentions toward another actor. Non-state actors can be motivated to seek weapons for offense/coercion if they seek to harm another actor for reasons not limited to revenge, removal or restoration.

Potential Examples: Syria acquiring main battle tanks for a planned offensive to retake the Golan Heights. Kurds acquiring chemical agents for a planned attack on a Turkish population center.

7. External Relations: Weapons proliferation manifesting from an actor's desired or current participation in an alliance or collective security organization. Also includes weapons proliferation resulting from an actor's bilateral relations with another actor, which may entail political support, military assistance, or economic incentives among others. Finally, external relations also entail incentives manifesting from a rejection of extra-regional, foreign influences such as Western presence. External relations is a salient driver if it can be assessed that the actor is probably motivated to acquire weapons due to the imperatives of its desired and/or existing relations with other actors for reasons other than offense and defense. For state actors, this driver often results from the requirement to develop or acquire weapons that enable participation in security structures, military operations or peace operations. Profitable alliances may also result in states proliferating weapons as a condition of the continued relationship. Non-state actors are often influenced by geographically separated state and non-state actors. These relations may be so extensive as to entail direct control, or they may be a balanced relationship based on shared interests that involves political and economic support.

Potential Examples: Bahrain acquiring advanced command and control systems to enable its Air Force to coordinate operations with other Gulf Cooperation Council members and/or the United States. Bahraini Shi'a acquiring training and explosive through its relations with the Lebanon-based Hizbollah.

Analysis: Middle Eastern state and non-state actors are impacted by the full range of drivers. Drivers are mutually reinforcing, compelling most regional actors to engage in weapons proliferation through 2015. Although traditional defense/deterrence and offense/coercion incentives persist, our analysis reveals the increasing importance of non-traditional motivators. Moreover, our analysis suggests a core set of "usual suspects" as continuing to be effected by the full range of drivers: Israel, Iraq, Iran, Syria, and Palestinians. As indicated in the table, a select group of non-state actors are also likely to be active in the weapons business through 2015: Palestinians, Kurds, Shi'a minorities, Islamic extremists (Hizbollah, Hamas, Gamat al-Ismaliyya), and others. Contrary to conventional wisdom, our analysis suggests that several high profile actors will have less than the expected incentive to develop and acquire weapons. For example, Libya and Lebanon are only motivated by 4 and 3 drivers respectively. Even with this lower ranking, our analysis makes it clear that the imperatives for weapons proliferation are strong from Morocco to Iran.

the Middle East is...home to ...actors ...having probable aggressive intentions or seeking offensive capabilities as a means to coerce and compel behaviors.

Defense/deterrence remains one of the most important drivers, applying to 28 of the actors we identified. Its salience is linked to the persistent number of actors (16) that seek weapons as a means to coerce and/or for offensive military action. Nearly every state actor is probably motivated by the need to defend its territory, resource and regime with the exception of Lebanon. Our analysis of Lebanon suggests that defense/deterrence, currently and for the foreseeable future, is provided by Syria and the Hizbollah. The defense/deterrence driver is also relevant to non-state actors, such as the Marsh Arabs (Shi'a) and Kurds, who will seek weapons for protection against attacks by the state or other non-state actors. Given the limited access by non-state actors to infrastructure and resources, they are most likely to seek conventional weapons and/or chemical and biological agents. The Middle East warrants special consideration in part due to the high numbers of non-state actors seeking weapons. To a greater extent than other regions, the Middle East is also home to a broad range of actors that we assess as having probable aggressive intentions or seeking offensive capabilities as a means to coerce and compel behaviors. Notably, these actors are concentrated in the Northern Persian Gulf and Levant sub-regions. Iraq, Iran, Israel and Syria stand out as state actors with probable coercive intentions. Of these, we assess Iraq as the most likely candidate for aggressive, offensive action against its neighbors. Iran's motivations are linked to its perceptions of the threats from the Taliban in Afghanistan, Iraq, and Western intervention. Offensive drivers in the Levant are principally a function of the Arab-Israeli conflict. The major participants assert the need for an offensive capability to take the fight in to the adversaries' territory and strengthen bargaining position. Changes in leadership may result in a shift away from offensive strategies, which would in turn reduce the potency of the defense/deterrence driver.

Among the non-traditional drivers, socio-economic forces stand out. Our analysis suggests that socio-economic factors impact 27 actors in a manner that increases the likelihood that they will engage in weapons proliferation. Social tensions and economic disparities exist throughout the region. Population growth rates of over 2.0% are the highest outside of sub-Saharan Africa. More than 40% of the population is under the age of 15. Combining this "youth explosion" with low earnings potential (Gross National Product per capita between $786 and $3,125 for non-oil rich Gulf states), literacy rates averaging less than 50%, limited political participation, and an urban population of 70% on average, results in an unprecedented pool of angry youth.[3] Wealth disparities resulting from corrupt authoritarian regimes also contribute to the disaffection. The overall result is a substantial segment of the population that is increasingly volatile and susceptible to militant or extremist factions. For example, the failure of the Iranian revolution to deliver on its many promises, particu-

larly in terms of economic development, has led to persistent unrest among students and merchants. Displaced persons will also persist as a challenge to host states, particularly in Lebanon and Jordan, as well as to those states to which they seek return. Non-state actors, such as the Kurds or the Azeris, will continue to be motivated by actual and perceived inequities, particularly in terms of economic investment and access to the political process. The Middle East is not exempt from the developmental challenges facing ¾ of the world's states. Nor is the region exempt from the ethnic and political forces of disintegration that have emerged on the heels of the Cold War.

Indigenous factions are also gaining prominence in regional weapons trade as independent non-state actors and as reasons for states to seek weapons. Our analysis suggests that 24 of the identified actors are motivated by a non-regime challenge. As discussed, many of these challenges exist in the Northern Persian Gulf and Levant, although growing concerns exist over factions in the Gulf States, Egypt, Israel and the Palestinian polity. Among the many regional factions, the Kurdish populations will remain especially relevant given their large population and their transboundary presence in Iraq, Iran, Turkey and Syria. Not only will weapons proliferations persist as an aspect of their struggle against the state, but relentless infighting will also remain a potent driver. Other Iraqi opposition groups are likely to remain active even with a regime change given the fractious ethnic, social and political nature of the Iraqi society. Islamic extremist groups will also continue to challenge regimes, and the increasingly likelihood of cooperation through global networks, such as Osama bin Laden's al-Qaida network, is certain accelerate the pace and scope. Evidence already exists to suggest that bin Laden emissaries are working to acquire WMD and provide training to a wide range of non-state actors throughout the Middle East. The increasing inter-connectively of extremist groups is certain to dramatically complicate arms control efforts. The Middle East is not unique due to the presence of numerous indigenous factions; however, the region is noteworthy for the extent to which these actors have become permanent and prominent players.

Resource/environmental factors will remain a highly relevant source of competition and conflict in the region with existing and potential resource disputes as a primary motivator for at least 20 actors to seek weapons. Water scarcity and oil will continue to be at the locus of resource disputes among state and non-state actors. In particular, water will remain at the core of Israeli-Arab disputes. Control of the Jordan River Basin and its headwaters are a central issue of the on-going peace process. Egypt will continue to be wary of Sudanese use of Nile waters. Syria and Iraq will continue to square off over the use of the Tigris and Euphrates river basins, but increasingly turning their attention to Turkey's damming of both. There is widespread agreement that water disputes will become "super-critical" in the coming 10-20 years. Relatedly, water scarcity also impacts agriculture. As water resources dwindle or actors lose access, there will be increasing incentives to gain access to more arable land-a limited asset in the region. Oil is an equally important resource, contributing to several conflicts in the past and certain to remain a source of conflict in the future as resources dwindle. Not only will states jealously guard their resources from other states such as Iraq, but they will also face challenges from indigenous factions bent on disrupting oil production as means of attacking the states. These concerns are especially relevant in the oil-rich Gulf State of Saudi Arabia. Access to resources is closely inter-connected, and a prominent factor in the Iran-Iraq War. Expect access issues to continue to be a source of tension and a motivator for acquiring weapons capable of controlling, gaining or denying access.

External relations serve as an important driver, impacting on 25 of the actors. Our analysis indicates that this driver is equally valid for state and non-state actors. Notably, participation in regional security frameworks and support to international peace operations are not principal motivators as they are in other regions. The possible exception is Gulf state participation in the Gulf Cooperation Council (GCC); however, we assess that participation in the GCC is not a primary reason for member states to acquire weapons beyond what they would acquire individually for defense/deterrence purposes. Rather, incentives primarily derive from participation in a profitable alliance and influence from dominant state actors. For example, GCC states will probably continue to seek weapons as a function of their bilateral defense relationships with Western powers-particularly the US. Gulf states such as Kuwait, Bahrain, Saudi Arabia, Oman and the U.A.E. are likely to continue to seek weapon systems from multiple companies that exceed their infrastructure capacity as an explicit or implicit aspect of their bilateral security relations with the particular trading partner. It could be said that they are buying protection from the seller rather than the seller's weapons. Dominant state actors will continue to direct, manipulate or otherwise control other actors as an element of foreign and defense policy. Non-state actors are particularly vulnerable or willing participants to such a patron-client relationship. We assess that Syria will continue to proliferate weapons as a function of its relationship with Lebanon, the Hizbollah and Palestinian groups. Iran and Iraq both provide support for a range of opposition groups and possibly terrorist groups throughout the region, such as the MEK, Marsh Arabs, and possibly the Shi'a in Saudi Arabia. A decline in client relations or a decrease in Western interest would reduce the influence of this driver on weapons proliferation.

Leadership/regime control was the least salient driver, affecting 15 of the actors. Although prestige was considered a possible motivator for all actors, our analysis indicates that it only existed as probable motivator for state actors such as Iraq, Saudi Arabia, Iran, Syria, Egypt and others. The more potent motivator in this driver category was regime control. The authoritarian nature of many Middle Eastern states causes many leaders to use weapons as a means of exerting control over factions within the regime. In Iraq, for example, weapons are apportioned to the Republican Guards, Air Force, Special Security Service and others in manner that prevents any one group from dominating and thus threatening the regime. Weapons are distributed within the U.A.E. in a manner that achieves balance between Dubai and Abu Dhabi, thus accommodating the influential factions. Absent a transition to more democratic forms of government, which we assess as unlikely, this tendency to accommodate, co-opt, balance and coerce will

continue.

WEAPONS

Definition: in an analysis of weapons proliferation, it is necessary to break out the categories of weapons that the actors both desire and/or have the capability to acquire. For the purposes of this analysis, weapons are divided into five categories (described below), which capture the essence of general capabilities the various actors desire to acquire. However, it is also important to note that while drivers may motivate actors to desire various categories of weapons, their capability to actually acquire them may be constrained by factors such as purchasing capital, adequate infrastructure to support a particular category of weapon, proper connections/ relations with neighbors/allies/suppliers to buy from, etc. For this reason, the matrix displays the actual probability of arms proliferation to the various actors based on both desire and capability.

1. Conventional: This category of weapons encompasses readily available and relatively low-technology weapons generally available on the open market, from small arms to commonly exported Soviet manufactured tanks and aircraft. In short, these weapons are the staples of any military and have relatively few sales and export restrictions. Examples of this category range from AK-47/M-16 small arms, to naval patrol craft and minor combatants, to third-generation fighter aircraft (MiG-21/MiG-23/Mirage III/IV).

2. Advanced Conventional: This category includes newer classes/generation of weapons, weapons upgrade kits, or advanced munitions that are usually not widely exported or at least are exported under close scrutiny or restrictions. While obviously more expensive, acquisition of weapons of this category reflects a significant upgrade in an actors defensive and offensive military capabilities and may greatly alter the actual/perceived "balance of power" in a particular region or relationship. Classes of weapons include US M1A1/2 Abrams, UK Challenger tanks; US F-15/16, Russian MiG-29/SU-27 aircraft; US Patriot, UK Rapier 2000, Russian SA-10 Surface to Air Missile systems; US Aegis destroyers.

3. Advanced Conventional-Missiles: Although of the advanced conventional class of weapons, we felt it was significant to break ballistic missiles out as a separate category. This allows better analytical capability when discussing the overlap between an actors desire/capability to acquire advanced conventional weapons versus the capability to have long range delivery capability for weapons of mass destruction (WMD). The intent here is to describe a category of weapons that provides the actor with some "beyond the FEBA" capability. In essence, this category describes a range of missiles from those meant for battlefield use (FROG-7/9) to MRBMs or ICBMs.

4. Biological/Chemical WMD: Biological and Chemical weapons of mass destruction are grouped together because they both employ dual-use technology, both are difficult to monitor, and the fact that similar justifications, drivers, and geopolitical circumstances lead an actor to pursue either capability. Chemical proliferation has typically been the more common of the two in recent years. Chemical weapons are relatively inexpensive and easy to produce. They are easy to deploy in a manner which is safe to the user, but which can also be very lethal against the intended target, if unprepared. They have often been used in warfare but are also easily countered with CW training and equipment. Although biological weapons are also relatively inexpensive, they are much more difficult to deploy on a massive scale and via means that is safe to the attacker. Thus, they have only demonstrated effectiveness at an individual or small group level. However, as actors gain the technological know-how, the potential lethality of biological weapons is much greater and thus, bio weapons may become the weapon of choice to terrorists or actors attempting to deter nuclear or other large scale attack against their interests.

5. Nuclear WMD: Although still considered a weapon of mass destruction, there is enough distinction between Nuclear and Chem/Bio acquisition drivers, development process, and capability to warrant establishing a separate weapons category.

Analysis: Based on the likely sequence of events over the next fifteen years, it should not be a surprise that each actor (of the 37 listed) will likely be driven to acquire conventional weapons, as each has sufficient motivation, drivers, desire, and capability to do so. Conventional weapons are effectively the common denominator in proliferation, but the types of conventional weapons desired and acquired will differ based on availability and need. However, the proliferation of conventional weapons is not likely to drive significant arms control initiatives or paradigm changes in the region. It must also be noted that the actual purchase of conventional weapons is on a downward trend in the region.

Regarding advanced conventional weapons, the predominant actors in this area of arms proliferation are state actors that are already the focus of US foreign policy in the region. These actors are already the subjects of significant US scrutiny and their arms transactions should not go unnoticed. What is significant is the potential of certain non-state actors to acquire advanced conventional weapons, specifically the relatively high ranking Iraqi Opposition and Mujahhadin e-Khalq (Iranian opposition) on the proliferation matrix. The ability of non-state actors to acquire advanced conventional weapons will almost certainly be based on some manner of sponsorship on the part of one or more state actors. In each of these cases, funding is available from an outside source. The US has promised funds to the Iraqi opposition, and the Iranian opposition are exiled in Iraq and have the support of Saddam Hussein.

Moreover, it should not be a surprise that the primary concern regarding weapons proliferation in the Middle East centers on weapons of mass destruction. Again, the primary concern regarding proliferation is the likelihood of acquisition by state actors. Of the first six actors on the prioritized list, five are state actors. Egypt falls just below the PLO/PNA (Palestine) simply because of the number and nature of the drivers. Nuclear weapons have yet to emerge among the Arab states, but Israel is an undeclared nuclear power and as such serves as a driver to its potential enemies in the region. Moreover, recent CIA assessments claim that that Iran may already have a limited nuclear capability. Iran is driven by Israeli weapons, the US presence in the Gulf and its own desire for hegemony, which means that its pursuit of nuclear weapons as well as IRBMs capable of carrying nuclear warheads will probably

continue as a means of obtaining deterrence and access-denial capabilities. Iraq was also a nuclear threshold state until the Gulf War introduced intrusive UN weapons inspections and the discovery and dismantling of the Iraqi nuclear program. Despite the Gulf War aftermath, it is also probable that Iraq, without sanctions, will be able to build nuclear weapons and ICBM capable missiles by 2015. It is now believed that it would only take Iraq several years after the ending of UN sanctions to rebuild its nuclear program.[4] Iraq remains the most dangerous of the three states mentioned above. Saddam has shown a willingness to use force against neighbors, to challenge Israel and the US directly, and he will likely rebuild his WMD program as soon as sanctions are lifted or become meaningless, which is highly probable during the next 5 years. Even a post-Saddam Iraq is likely to remain dangerous due the Iraqi ambitions that will likely succeed him. The only other actors seeking nuclear weapons in our assessment are Libya, which currently lacks sufficient resources to obtain the required technology, will continue to do so and will thus not obtain a weapon during our timeframe; Egypt, which will not seek such weapons under the current regime, but would perhaps do so if a more radical regime were to come to power; and Algeria, but again, only if a radical regime were to take power.[5]

However, it is the non-state actors on the list that require additional attention because such actors have not traditionally been a focus of US foreign policy. Significantly, there are five non-state actors that rank relatively high on the list (those with 4 or more drivers) that have the desire and capability to acquire biological and/or chemical weapons (PLO/PNA, Kurds, Hamas and Hizbollah). Of these, four of the five are located in the Levant, a development that deserves further study. The fifth (Saudi Shi'a) is also significant, especially if combined with the wild card development of a sudden Saudi regime change or collapse. A further discussion of potential threat scenarios follows.

Finally, a note on information operations/warfare. Although IO/IW was not part of this analysis, the reader must be reminded of the ongoing Israeli-Palestinian conflict and note that indications are present that these two actors are actively using the information weapon against one another in the ongoing conflict, which began during fall 2000 in what is now known as the Al-Aqsa Intifada.[6] As more details come forward and as this field of warfare becomes further developed, the Middle East could emerge as the first region to actively test its precepts. Further thought and analysis is needed to understand the effects of this potentially destabilizing asymmetric means of warfare.

THREAT SCENARIOS

Major Proliferation Threats: Many of our concerns have already been expressed in the sections above, especially WMD concerns in the last section. However, the major concern that must be highlighted is the failure to resolve the Arab-Israeli peace process. This has resulted in an environment for the most probable scenarios of conflict in the Middle East. War between Palestine and Israel is a strong possibility given the increasingly desperate conditions of the Palestinians that will result from continued conflict, border closures, and lack of economic activity. Palestinian extremist groups and Hizbollah already use conventional small scale attacks against Israel and in the future are likely to resort to larger scale attacks including chemical weapons, perhaps within the next 5 years. Hizbollah also acts as a non-state surrogate for Syria and has its support, which could include the transfer of more advanced conventional and WMD weapons for use against Israel as tensions continue to build. The Palestinians are also likely to gain weapons and funding from other Arab states if conflict continues, suggesting escalation to a regional-level war is also possible (though less likely). Likewise, Arab tensions with Israel contribute to the Iran-Iraq-Israel rivalry, the three actors of most concern to our study. Arab-Israeli peace would remove some of the natural animosity between Iraq and Israel. Although the rivalry is likely to continue due to a balance-of-power rationale that exists in the region, Arab-Israeli peace would open opportunities for dialogue, which in turn would improve the prospects for introducing confidence and security building measures (CSBMs) among these key players, a first step in the arms control process. US policy should focus on serious efforts to move the peace process forward as a first step to lowering tensions in the region.

Palestinian extremist groups and Hizbollah ...are likely to resort to larger scale attacks including chemical weapons...

Another concern is the potential rivalry between Iran and Saudi Arabia. Although these actors have recently moderated their stance toward one another due to Iran's moderating behavior and Saudi-Iranian diplomacy, which recently led to the signing of a security agreement, the Iranian effort is likely aimed at reducing Saudi threat perceptions so that US forces will eventually be told by the Saudis to go home. If US forces are asked to depart Saudi territory, then it will be much more difficult to counter the growing ability of Iran to project power in the region. The US departure could lead to Iranian bullying of the Gulf states, but more importantly, could also result in another Iran-Iraq war as hostilities between those states would not be kept in check by US presence in the region. American diplomacy should focus on improving relations with Iran to reduce its perception of the need for access-denial of US forces in the region. The US presence deters Iraq and protects our Gulf allies.

Wild Card Scenarios: Listed here are the less likely developments, but those that should not be overlooked when developing foreign policy for the region:

1. Iraqi Regime Collapse/Civil War. A civil war is probable after Saddam's passing as a result of competition among the other Iraqi non-state actors mentioned in our driver analysis (Iraqi Opposition/ Kurds/Marsh Arabs). This could fractionate the state of Iraq and would likely have spillover effects, especially if the Kurds established their own state in northern Iraq. A Kurdish sovereign actor might appear as a threat to Turkey and Iran since both states harbor significant Kurdish populations.

2. Mujahhadin e-Khalq. This Iranian opposition group regularly operates against the Iranian government from its "safe-haven" in Iraq and was recently attacked by the Iranian government with Scud missiles. Such attacks increase ten-

sions between the Iranian and Iraqi governments and increase the likelihood of conflict between them. The group's presence in Iraq is surely to continue to be a source of conflict between two of our top actors of concern.[7]

3. Egyptian Regime Collapse/Extremist Takeover. Should extremists take over the Egyptian government, the cold peace between Egypt and Israel would end and hostilities would very likely erupt. Egypt would likely support Palestinians and make every effort to renew a two front war (to include Syria) against Israel.

4. Saudi Regime Collapse/Extremist Takeover. Should extremists take over the Saudi government, the US would be barred from the region and the oil supply would be threatened. Iran or especially Iraq would likely attempt to gain control of the oil supply, even the territory of Saudi Arabia.

5. Iranian Civil War, or Iran-Afghanistan War. Currently, Iran has a favorable regime in power, although it continues to struggle with the clerics on moderating its stance vis-à-vis the West and improving its economy through greater contacts with the West. However, should the clerics depose President Khatami, a civil war might erupt and such a disruption could return Iran to the unstable conditions of the 1980s. Such instability could result in closure of the Gulf and/or another war with Iraq. Another potential wild card that could leave Iran in a vulnerable state is war against the Taliban in Afghanistan. The Iranians would likely win such a war, but would be severely weakened and again vulnerable to the same threats mentioned above as a result.

6. Turkey-Israel Alliance. Although Turkey was not evaluated in this study, there is a growing alliance between Turkey and Israel. Should either or both states feel shunned or abandoned by the US or the West, they are likely to become more aggressive against neighbors and may act preemptively against perceived threats. Some Turks have expressed this sentiment already[8] and Israel could also sense a loss of support if public opinion in the US turns against it due to its current actions against the Palestinians. Since both control vital water resources, wars over water are also a growing possibility as populations continue to grow among Arab neighbors and serious water shortages are projected for the near future.

SUMMARY

Our analysis is an attempt at a new approach to understanding proliferation in the Middle East by analyzing the reasons that drive it. Those actors having the most drivers are those most likely or probable to stir up trouble, to proliferate-in order to acquire the capability requirements that might allow them to achieve their objectives. The drivers represent reasons for tension and it is assumed that actors will work to lessen tensions by eliminating the drivers that cause them. We identified seven major categories of drivers and 37 major actors that are affected by the drivers. We also attempted a brief capabilities analysis by including the types of weapons actors will seek to acquire. Actors with greater capabilities may be driven to go after WMD and advanced conventional weapons, although in some instances we have identified more capable states that are not seeking WMD, such as Saudi Arabia. As a signatory of the NPT, BWC and CWC, the Saudis want to remain compliant to international treaties and instead seek advanced conventional weapons as well as western assurances and help to satisfy their security concerns. We also mentioned their recent security agreement with Iran, which is perhaps an additional hedge in case western assistance is not forthcoming. Our most significant concerns revolve around the three top actors: Israel, Iran and Iraq for the reasons mentioned. Not only have past wars involved all three, recent events indicate adversity for all three actors, and our driver's analysis shows that they are the most probable proliferators as well as the most capable in the region.

END NOTES

1. Anthony Cordesman, Weapons of Mass Destruction and Arms Control in the Middle East, CSIS Study, January 2000. 3-4. Online at www.csis.org. Accessed during March 2001.

2. Actually seven if we were to include Eritrea in our analysis, an African state bordering the Red Sea. Data from the IISS Annual Report, 1999. As reported in Gulfwire, 25 October 1999 (on online email subscription weekly news service provided by the National Council on US-Arab Relations, Washington, DC)

3. John L. Allen, Student Atlas of World Politics, 4th edition, 2000.

4. See CIA, Global Trends 2015, December 2000. Onlineat www.cia.gov/publications/globaltrennds2015/ Accessed during April 2001.

5. The current Algerian Ambassador to the UN led the recent NPT renewal efforts, perhaps demonstrating that Algeria's current government is very much against nuclear proliferation. Ambassador Abdullah Baali, Permanent Representative of Algeria to the United Nations, speech at the Eleventh Annual International Arms Control Conference, Sandia National Laboratories, Albuquerque, NM 21-22 April 2001. It must also be noted that Algeria created a covert nuclear research program that was active until the early 1990s. Sufficient infrastructure is in place to resume the program should the government change directions. See Anthony Cordesman, WMD in the Gulf and Greater Middle East, CSIS Study, 9 November 1998, 50. Online at www.csis.org. Accessed during April 2001.

6. Named such because of then candidate (now Prime Minister) Ariel Sharon's visit to the Al Aqsa Mosque (located on the Jewish Temple mount) in Jerusalem. This provocative visit to the third most Islamic holy site acted as a catalyst for the fall 2000 Palestinian uprising against Israel which continues to the present date (April 2001).

7. "Tensions Between Iraq, Iran Rise After a Missile Attack On Rebels," Wall Street Journal, 19 April 2001. Online at www.WSJ.com. Accessed on 19 April 2001.

8. Duygu Bazoglu Sezer, a Professor at Bilkent University in Ankara, Turkey expressed Turkish concern over being abandoned by NATO, Europe, and perhaps the US in a speech at the Eleventh Annual International Arms Control Conference, Sandia National Laboratories, Albuquerque, NM 21-22 April 2001.

NORTHEAST ASIA

Northeast Asia continues to be an unpredictable region with issues such as Taiwan and Korean unification influencing the possible arms control scenarios to the year 2015. Colonel Thomas A. Drohan, Commander and Permanent Professor of the 34th Education Group at the Air Force Academy, presents his views on likely events occurring in Japan. Dr. Paul J. Bolt from the Academy's Department of Political Science addresses China, and Dr. William E. Berry, Jr., also of the 34th Education Group, makes some predictions about the Korean peninsula. Colonel Drohan stresses the importance of the U.S.-Japan security relationship and its influence on Japan's defense policies. He argues that as long as this relationship remains viable, it is unlikely that Japan will change its policies appreciably. However, if the United States disengages, Japan will have to reevaluate its defense strategies, particularly if changes occur in the region such as a unified Korea with nuclear weapons or a more militarily potent China.

Professor Bolt examines some of the domestic political and economic factors at work in China and their likely influence on China's military modernization policies. While China desires regional peace and stability in order to concentrate on economic growth and development, resolving the Taiwan problem will continue to be of extreme importance. Professor Berry also explores domestic political and economic issues in both North and South Korea and their effects on defense policies. As in the case with China and Taiwan, how the Korean peninsula is unified and which country's direction will have a major influence on the security of the region and arms control considerations to 2015 and beyond.

Japan

Thomas A. Drohan

Historical Analysis

Rather than agreement on common threat, the basis of US-Japan security cooperation is an exchange of interests designed to achieve relative economic and military advantage over various threats. Institutionalized in a series of occupation documents after WWII, the founding exchange of interests constituted the following quid pro quo: democratized Japan would pursue economic reconstruction, rearm for self-defense within constitutional limits and economic priorities, and allow US forces to continue to be based in Japan. In exchange, the US would guarantee Japan's military security until Japan could achieve self-defense, extend aid for re-industrialization, and provide defense assistance for rearmament.

This original exchange has been quite resilient and is reflected in Japan's still operative 1957 Basic Policy for National Defense: manage the US-Japan defense relationship as the basis of Japan's defense policy and subsequent moderate defense strengthening; maintain an exclusively defensive orientation; adhere to the three non-nuclear principles; secure civilian control of the military.

Subsequent Japanese policies and constitutional interpretations include rejecting the UN-recognized state right of collective self-defense and devoting no more than one percent of the GNP to defense (although personnel costs are excluded).

Japan's faction-ridden domestic politics have generally reinforced dependence on the US military security guarantee while allowing the self-defense forces to build a formidable capability. Prior to 1993 internal politics have been dominated by the business establishment oriented, conservative Liberal Democratic Party. In 1993 the LDP splintered and a temporary coalition of opportunist small parties emerged which have proven to be acutely vulnerable to any swings in the economy, US-Japan security relations, or charges of political corruption. In 1994, reform of the 1947 electoral law replaced the exclusive multi-member district system with a combination of single-member plurality and multi-member proportional representation in larger-sized districts. These changes increased political competition and led to the rise of more new parties, which has led to further fragmentation and weaker governments. Domestic politics have been interesting but fundamentally irrelevant to the framework of Japan's security policy, frustrating its management but leaving its parameters unchanged. Japan's only reasonable strategic option – alliance with the predominant regional power -- has been modified by economic and technological developments rather than any new directions advocated by any credible and nationally attractive political leader. For example, former LDP member and current Liberal Party leader Ichiro Ozawa has advocated Japan as a "normal country" (revised constitution with an unfettered military), but currently seems more connected with the Japan Communist Party in a frantic search for an opposition coalition.

There have been four major, "first-ever," adjustments to the original exchange of security interests, each of which has been politically controversial at the time, but which overall have preserved the military-economic exchange:

1. 1960 Treaty of Mutual Security & Cooperation: the only revision of the original 1951 Security Treaty; Prime Minister forced to resign

2. 1981 Reagan-Suzuki Communiqué: the first division of military roles; Foreign Minister forced to resign

3. 1989 FS-X Fighter Aircraft Agreement: the first co-development of military technology; strained economic competition in military technology

4. 1997 Guidelines for Defense Cooperation: first coordination of military roles (the 1978 Guidelines continued the existing division of roles, rather than expand toward coordination of roles); intensified local political opposition to US bases in Japan

The first three adjustments have expanded the US military guarantee and increased Japan's economic contribution to security, while gradually increasing Japan's military role. Japanese economic growth has led to more financial support of US basing, and more development aid that promoted mutual interests. Domestic opposition in Japan to US bases has tended to spike over specific incidents (from the 1954 Girard case to the 1995 Okinawa rape case), fading away after concessions are gained. Technological advances and US rearmament programs have enabled increases in Japanese military capability within constitutional interpretations. Except in the mutually maligned FS-X fighter aircraft co-development agreement (a compromise between Japanese indigenous development and an American sale to Japan), policy makers have succeeded in insulating defense cooperation from economic disputes.

The current US-Japan defense guidelines adjust the security arrangement

toward more equivalent military commitments. If actually implemented as approved, the self-defense forces would coordinate specific military roles within constitutional limits which on a case-by-case basis could provide rear area support of US combat operations. By specifying Japan's military commitments, the guidelines raise expectations of an alliance based on mutual commitments (a military quid pro quo). But the guidelines also provide Japan a bilateral foundation for greater multilateral freedom of action.

Defense Plans

Following a series of four five-year defense plans (1956-1975), Japan's National Defense Program Outline (NDPO) of 1976 established annual plans through 1990, (Mid-Term Defense Planning Estimates) that eventually fulfilled the NDPO's target force structure. All was still justified within the US-Japan security embrace. This was a more politically acceptable way to fill Japan Self-Defense Force (JSDF) requirements with an unspecified timetable and reflected the weak bargaining position of JSDF in the interagency process. The 1990's saw Japan pass the UN Peacekeeping Operations Law with JSDF participation in UN operations in Cambodia, Mozambique, Zaire, Syria and Israel. Japan attempted closer defense ties with South Korea through exchange visits, port calls and air safety coordination. A new NDPO in 1995 streamlined and modernized the force (more reliance on satellites, improved logistics, reduced ground divisions and tanks, explicit US-Japan joint defense planning operations). The current plan (2001-6) emphasizes diverse roles with power projection capability, although the Japanese government adamantly denies that it is developing an offensive option. Equipment includes 13,500-ton helicopter-carrying destroyers (larger than Italy's *Garibaldi* which accommodates 18 helicopters or 16 AV-6 Harriers) replacing smaller destroyers; airborne tanker/transport aircraft; and reconnaissance satellites (prelaunch or early warning).

Alternative Futures

Any speculation about Japan's security role must address the persistent question of constitutional revision.

A. NO REVISION OF JAPAN'S CONSTITUTION

Absent revision of Japan's "no war" constitution, the US-Japan security alliance can best respond to external challenges with three types of limited adjustments.

1. First, military-economic agreements can retain the US military guarantee in exchange for Japanese financial compensation and economic contributions to security. The limits are American reluctance to provide mercenary services, reduced Japanese ability to pay (such as the prolonged recession), and the exclusive benefits of economic aid. The recent decision to reduce Japan's host nation support payments in the next five-year agreement indicates Japan's reduced ability to pay. If the US economy stalls for an extended time, US-Japan economic tension may rise and the "unfair" terms of security alliance may become an issue.

2. Second, enhanced military cooperation can replace the military-economic quid pro quo with mutual commitments against clear threats such as terrorism, drug trafficking, and external aggression. Japan's constitutional and political restrictions on its military role will limit its contribution to homeland defense capabilities.

3. Third, technological advances can produce new areas of security cooperation within existing restrictions, such as information network defense and theater missile defense. Information operations provide a non-lethal alternative to physical application of force and may extend the boundaries of bilateral military cooperation. The limits are economic interests that are deemed to be matters of national security and therefore not areas for cooperation. On a case-by-case basis Japanese forces could participate in non-combat or information support of UN multinational operations. This will likely depend on the domestic standing of the Prime Minister which is likely to be very weak.

B. REVISON OF JAPAN'S CONSTITUTION

Revision of Japan's constitution expands the possibilities of Japanese security roles. It is highly unlikely constitutional revision would occur without a significant external event prompting it. Such external events could include US disengagement from East Asia or a reduced credibility of the US security guarantee to Japan; a reunified Korea looking to expand defense ties with Japan; reunification of an aggressively oriented Korea; a significant terrorist attack on Japan with ineffective JSDF or US response; and deteriorated Japan-China, Japan-Russia or Japan-Korea relations. In all of the following scenarios, constitutional revision could be prevented by a strong, credible US military commitment in East Asia.

1. US disengagement from East Asia, or the reduced credibility of the US security guarantee to Japan or regional stability.

Some who argue for a "fortress America" retraction from East Asia suggest that aerospace and information capabilities might provide a margin of advantage needed for credible extended security. A serious public education and security awareness campaign would have to be conducted in Japan and the United States for this to be seen as credible by Japanese, or be seen as desirable by Americans. Without a firm aerospace or ground presence in Asia, US maritime presence may only deter nuclear SSBN with JL-2 ballistic missiles rather than conventionally armed ballistic missiles. As China and North Korea proliferate (particularly the latter to earn hard currency during economic distress) into longer-range missiles that threaten the US, American and Japanese interests converge but also favor a US national missile defense (NMD) option. A capable NMD could decouple the US security guarantee from Japan and encourage a Japanese preemptive strike capability unless accompanied by a robust theater missile defense (TMD) justified by strong and enduring US interests in East Asia. On the other hand, Chinese or North Korean medium range missiles that threaten Japan and deployed US forces encourage TMD under a tighter US-Japan alliance. However, TMD would also facilitate the defense of Taiwan. In the absence of a clearly credible US security guarantee, technologically enabling the defense of Taiwan without combined (assisted by Japanese forces) courses of action against the PRC entices Chinese aggression and forces the US to respond without regional support

2. A South Korea or reunified Korea looking to forge closer defense ties with Japan.

South Korea might attempt to balance against China and fix Japan's military

power potential in place with a proposed security alliance if the US presence were not seen as credible. Japan would not want to be dominated by a constitutionally unfettered Korean military in a relationship prompting constitutional revision. Japan forces Korea to balance with Japan either through a trilateral arrangement including the United States, or on a bilateral basis. For Japan, ties with Korea could reduce dependence on the US, presenting the prospect of an Asian liberal tandem against Chinese military power. Due to mutual historical distrust stemming from Japan's 1905-45 occupation of Korea, Japan is more likely to develop more offensive capabilities in a Japan-Korea security arrangement if the US were excluded. Accordingly the best option is a trilateral US-Japan-ROK alliance based on maintaining regional stability and non-aggression.

3. Reunification of an aggressive offensively capable Korea.

Failure to dismantle 1300-km range No Dong missiles might indicate Korean intent to become a Northeast Asian sub-regional power outside the US-Japan relationship. This would almost certainly reinforce constitutional revision and revive Japanese competition against potential Korean dominance. Without a US military commitment, Japan's strategic choices would be to enter into an agreement with Russia (unlikely given economic state and military budgets), with China to maintain stability and deter Korea, or develop a nuclear deterrent capability. With a credible US military commitment, the US-Japan security relationship would likely become a traditional alliance to dissuade undue Korean influence.

4. A significant terrorist incident in Japan.

A deliberate attack such as a North Korean sponsored conventional, biological or chemical weapons, or an effective computer attack against the finance system or energy grid. North Korea's employment of weapons through agents rather than missile munitions might intimidate a weak Japanese coalition government to support North Korea terms in a transition to unification. A JSDF just waiting to prove its mettle could earn domestic credibility for subsequent mission expansion and constitutional revision with an effective performance. Ineffective US and Japanese Self-Defense Force response could trigger constitutional revision on less favorable terms.

5. Deteriorated Japan-China, Japan-Russia or Japan-Korea relations.

Territorial conflict with China over the Senkaku islands, with Russia over the northern territories, or with Korea over the island in the Korea (Tsushima) Straits. A serious China-Russia security pact, or a Korean tilt toward China would leave Japan isolated looking for a major power. North Korean firing of another missile over Japan after a period of worsening US-North Korean relations or a due to a spiraling North Korean economy could drive a wedge into US-Japan relations, attract US attention and extract US aid to North Korea. Japan's reaction is likely to be different (if the 1998 North Korean missile shot is a precedent) with a curtailment of aid and alarmism that might result in constitutional revision.

Failure to dismantle 1300-km range No Dong missiles ...indicate Korean intent to become a Northeast Asian sub-regional power...

China

Paul J. Bolt

China's relationship with the United States is marked by conflict and cooperation, both in the economic and political-military realms. Many analysts expect to see an intensifying rivalry between the two states in coming decades, driven by a realist logic that inevitably will lead to clashes between a rising power in the East and a status quo power in the West. Others are hopeful that commercial interaction and global interdependence will liberalize Chinese politics and create a more cooperative relationship, one akin to that between the US and Japan. While the United States can shape the outcome of its relationship with China in the year 2015, other factors will be outside of its control. These include changes in China's domestic politics, developments in China's economy, shifts in the regional and international balance of power, and the actions of Taiwan.

Changes in China's domestic politics are difficult to predict. However, because of China's rapid economic growth and the ensuing social changes, it is becoming increasingly problematic for the Communist Party to cling to a monopoly of power. This raises questions as to how long the political status quo can continue. There are several signs which indicate that the party must change the way it does business. First, with the Internet, international contacts, and the upgrading of communication links, the party has lost its control over information. Even the Chinese press is more open than in the past. Second, the party is facing social problems that are directly related to the party's monopoly on power. These include corruption, organized crime, the Falun Gong movement, and efforts to reverse the Tiananmen Square verdict. Third, the party has failed to establish reliable and legitimizing succession policies. The result is that future leaders will be weaker and less capable of resisting political pressure from the military or nationalistic forces that advocate a strident defense of perceived Chinese interests. Finally, the current system gives little incentive to separatist groups in Xinjiang or Tibet to return to the fold, nor to Taiwan.

The current challenges to the Communist Party could lead to four outcomes by 2015. The most desirable is a gradual liberalization in policies that eventually lead to democratization. While a democratized China would still present challenges to the United States, these issues would likely be resolved by peaceful means. The second scenario is for the party to somehow muddle through without fundamental change. The third scenario is a party crackdown on dissent, with an imposition of greater authoritarianism justified by extreme nationalism. Such a scenario would intensify the rivalry with the United States. The final, and perhaps least likely scenario, is a break-up of China. This too would damage US interests due to the ensuing destabilization of all of Asia, creating unprecedented refugee flows, weapons transfers, and a possibly aggressive successor state.

If China maintains political stability, it is likely to enjoy healthy economic growth, surpassing the US in total GNP sometime in the next quarter century. Nevertheless, growth will primarily benefit urban areas and the coastal provinces,

in spite of Beijing's efforts to develop its central and western regions. Thus in 2015 areas of poverty will remain. In fact, unrest caused by relative deprivation has the possibility of impeding China's growth rate and fueling ethnic separatist movements.

In the early phases of its reforms, growth in China was driven by cheap and abundant labor. By 2015, Chinese growth will be propelled more by high-tech industries, such as the design and production of computer hardware and software. Much of the know-how behind such industries will be provided by Taiwanese, and Chinese high-tech firms will be firmly linked with US companies as both suppliers and competitors. China's manufacturing capabilities and overall standard of living will also increase by 2015, leading to the necessity to import large quantities of oil from Central Asia or the Middle East.

Militarily, the People's Liberation Army (PLA) will be an improved force by 2015. Its strategic focus will continue to be "Local Wars Under High-Tech Conditions," and it will have made progress in actually being able to project the force necessary for such a strategy through enhanced naval and air platforms and rapid reaction forces. The Chinese military will also have enhanced missile capabilities both at the strategic and theater level, capable of striking the US and America's Asian allies. For example, the DF-31 is a three-stage, solid fuel, mobile missile capable of striking the western United States, with the JL-2 being its sea-based variant. Across from Taiwan China is also deploying hundreds of intermediate-range and short-range ballistic missiles, the CSS-6s and CSS-7s. US antimissile systems will give the Chinese political justification for their expanded arsenals.

Clearly the PLA's overall capabilities will be continue to be inferior to those of the US in 2015. While the military's budget is expanding, China's highest priority will continue to be economic growth. Nevertheless, in spite of this inferiority, the Chinese military will have certain advantages over the US in any foreseeable Asian conflict. These include shorter supply lines and potentially greater political will to accept casualties and win a conflict. The PLA will also have new capabilities to threaten American information systems, both at the civilian and military levels, as the fruit of Chinese efforts to develop asymmetric means to confront the United States.

On the international scene, China will still consider the United States its biggest rival. Nevertheless, China recognizes its need for a peaceful regional environment for many years to come if it is ever to equal the US in economic, political, and military power. But in spite of China's desire for regional stability, the most likely event to trigger a US-China military confrontation is Taiwan. Conflict over Taiwan could erupt over two issues. The first is movement by Taiwan toward formal independence. Such a move would force China to take action. The second trigger is Chinese loss of patience over its continuing inability to solve the Taiwan problem, leading it to attempt to resolve the situation by force. However, in spite of China's declaration that the Taiwan issue will not be left unresolved indefinitely, it is not likely that China will provoke military action due to lack of progress unless there is a fundamental shift in China's domestic politics. China has waited over 50 years for reunification with Taiwan, and the results of an unsuccessful effort to retake Taiwan by force would be devastating. If China does take military action against Taiwan, it is likely to be done in a surprising fashion intended to have maximum political effect, including the use missiles based in southeastern China. In light of the experiences of the United States in the Korean War, the US should not be overconfident in its ability to win a cheap victory in the Taiwan Strait.

In the rest of Asia, in 2015 China will continue to work toward both the prevention of war on the Korean peninsula and discourage, although not openly, Korean reunification. While North Korean belligerence justifies an American and Japanese military buildup, a united Korea with or without a US military presence is seen to pose a potential threat on China's border. China will continue to be extremely sensitive to any buildup of the Japanese military. Therefore the United States presence in Japan is seen as both a blessing and a curse. While enabling American force projection, it also serves as a restraint on Japan. Russia will still be recovering from its long slide, and thus will not pose a major threat to China. However, China will be more involved in Central Asia due to its oil needs. It will also have an increasing rivalry with India, as both states seek a dominant position in Asia and influence in the Indian Ocean.

In sum, China's leaders expect to maintain a communist monopoly of power and hope to preserve a peaceful international environment over the coming years so that China can expand its economic, technological, and military power. Nevertheless, it faces serious challenges, especially in regard to its domestic political situation and Taiwan. The resolution of these issues will have important ramifications for China's relations with the United States.

The Two Koreas

William E. Berry, Jr.

Historical Background

The Soviet Union and United States divided the Korean peninsula at the conclusion of World War II, and then were unable to agree on a plan for reunification. When the United Nations also failed to resolve this issue, largely because of Cold War tensions, the Republic of Korea (ROK) (South Korea) and the Democratic People's Republic of Korea (DPRK) (North Korea) came into existence as independent countries in 1948. The Korean War further alienated the two Koreas, and the U.S. and ROK negotiated the Mutual Defense Treaty (MDT) in 1953 with the primary intent to deter North Korea from another attack. The MDT provides the basic justification for the stationing of American military forces in South Korea that total approximately 37,000 in 2001. North Korea entered into a similar security arrangement with the Soviet Union and China. As a result of these actions, the Korean peninsula remains a legacy of the Cold War and one of the most dangerous regions in the international system.

Political Issues

During the first 40 years of the ROK's existence, its political system was dominated by authoritarian military regimes. The rationale for these regimes generally included references to the severe threat from the DPRK and the need to rapidly develop the South Korean economy. There is no question that South Korea made impressive progress with its economy, but at the cost of political freedoms. The democratization

process began in earnest during the 1980s as the expanding middle class demanded more participation in the political process and international attention increased when the ROK was selected to host the 1988 Olympics. Popular elections were held for president in 1987 and again in 1992 when a civilian was elected. The most dramatic example of the democratization process occurred in late 1997 when the Korean population elected Kim Dae Jung who had for many years been the most outspoken critic of military rule as well as an advocate for democracy and human rights. President Kim will complete his term of office in 2003 and cannot succeed himself under the Constitution. As is true for any democratic political system, he has attempted to build public support for his programs, but it remains to be seen how the outcome of the next election will affect his policies, particularly those involving the DPRK and possible reunification of the peninsula.

President Kim Il Sung dominated the DPRK from 1948 until his death in 1994. The cult of personality associated with Kim as the "Great Leader" is difficult to explain, but is perhaps best understood by the fact that Kim has been designated as the Eternal President after his death. He began to prepare for his political succession in the early 1980s by designating his son, Kim Jong Il, as the heir apparent. The elder Kim appointed his son to important positions in the Korean Worker's Party and on the Military Commission in the effort to shore up support for the transition. After Kim's death, his son appears to have solidified his position over the past several years, particularly with the Korean People's Army. Since his deceased father has the title of Eternal President, Kim exercises his power primarily through his position as Chair of the Military Commission. Looking to the future, a critical issue for continued political stability in North Korea involves the succession process once Kim Jong Il passes from the scene. It does not appear that he has designated a successor and whether or not this hereditary succession will continue remains to be determined. Because the two Kims have dominated North Korea for so long, it is difficult to foresee who may be the next leader, and even more difficult to predict what policies this person may pursue toward the ROK and reunification.

President Kim Dae Jung initiated his Sunshine Policy toward the DPRK soon after coming to office in 1998. This policy is designed to separate politics from economics and to address the extremely dire economic problems in North Korea. He has established bilateral assistance programs to provide food to the starving DPRK population, encouraged South Korean direct investment in the North, and worked hard to gain American, Japanese, and international support for North Korea. His policy initiatives have had some success with the most important achievement to this point coming in his visit to Pyongyang in June 2000 and the summit meeting with Kim Jong Il. North Korea's Kim is scheduled to pay a visit to Seoul sometime in 2001, but the exact date has yet to be determined.

Despite the fact that a significant majority of South Koreans support eventual reunification with North Korea, Kim's Sunshine Policy remains controversial. As the ROK has been rocked with a series of economic crises in recent years, part of the concern in South Korea involves the probable costs associated with reunification that the South will have to assume. Another issue concerns reciprocity since most of the concessions to this point have been made by South Korea with few coming from Pyongyang. Several leaders of the Grand National Party, the major opposition party, have been critical of Kim and his policies so that questions remain as to what direction the ROK will take after the next presidential election. Further complicating this political situation is the change in American administrations. President Clinton was very supportive of Kim's policy, but President Bush is much more cautious as evidenced by the first Kim-Bush summit in Washington during March 2001. Because of the long-standing U.S.-South Korean relationship, the position that the American government takes on issues such as this is considered very important in Seoul.

Economic Issues

As indicated earlier, South Korea experienced impressive economic growth and development beginning in the early 1970s. However, the Asian economic crisis in 1997 came as a major shock and sent the economy into a severe downturn. The International Monetary Fund provided a $57 billion loan which the ROK has now repaid. Although reforms were initiated in the financial (banking), corporate, and labor sectors, it remains to be seen whether these reforms have gone far enough in addressing the severe structural problems the ROK's economy confronts. The indicators in early 2001 are not encouraging as the economy continues to contract.

Economists disagree on the likely costs of reunification, but the estimates range from several billion dollars to as much as a trillion dollars. Whichever is correct, these are substantial sums of money that the ROK will have difficulty providing even with the assistance of the U.S., Japan, and international lending institutions. This reality is particularly apparent based on the current economic problems the ROK confronts. When considering reunification costs, a comparison with Germany is frequently cited. However, it is quite possible the proportionate costs for South Korea will exceed those of West Germany because the population of North Korea is greater than that of East Germany and the gross domestic product of the DPRK is less in relation to that of the ROK than was the East German GDP in comparison with West Germany's. In any event, the substantial costs that will be associated with reunification have contributed significantly to some of the public criticism of Kim Dae Jung's Sunshine Policy and may influence future initiatives to the DPRK.

By any standard measurement, the DPRK economy is in shambles. Starvation and malnutrition are rampant as reported by a number of international food agencies which have visited North Korea to monitor how their food assistance is being distributed. Part of this economic failure is attributable to Kim Il Sung's Juche policy which remains an extreme form of self-reliance and has been continued by Kim Jong Il. Also important is the economic relationship which the DPRK and the Soviet Union established. The Soviets subsidized Kim's policies and provided other economic assistance over the years. When the U.S.S.R collapsed, this economic support ceased. A further complication is that China used to provide assistance based on "friendship prices," but has begun to charge market value for its programs in part because it no longer is in competition with the Soviets for influence in North Korea.

One of the only sources of DPRK foreign exchange is the export of military equipment, particularly missiles and mis-

sile parts. These exports have led to conflicts with the United States and remain a major source of contention. Regardless of the economic difficulties Kim Jong Il faces, he has been reluctant to initiate necessary reforms that would address these difficulties. To do so would probably result in the introduction of foreign ideas and concepts that he and his father before him have been dedicated to preventing. Also, to change from adherence to the Juche policy could undermine the very political legitimacy he relies upon to remain in power. Nonetheless, Kim visited Shanghai early in 2001 and expressed support for some of the economic reforms China has introduced. Whether he decides to try some of these reforms in his own country remains a major issue, but there is little likelihood that the North Korea economy will improve appreciably any time soon if ever. The possibility of a total collapse remains real even though the North Korean people have become used to extreme economic deprivation over the years.

Military Issues

The South Korean-American security relationship and the stationing of U.S. forces along strategic invasion routes north of Seoul remain extremely important to the ROK. But Seoul has also expended significant resources to assist in providing for its own defense. It has a 675,000 strong military that is equipped with modern hardware. In 1998, South Korea had a GDP of approximately $426 billion and allocated about $13.2 billion for defense or in the range of 3% of GDP. Earlier in 2001, the United States and the Republic of Korea reached an agreement that will enable the Koreans to develop missiles with a range of 300 km and carry conventional warheads of up to 500 kg. The two countries had previously agreed in 1979 that South Korea would limit the range of its missiles to 180 km, so this change is important because it provides the ROK with a deterrent missile capability which can strike anywhere in North Korea. It also is indicative of the expanding North Korean missile program and how this program is viewed in Seoul.

Because of concern about the credibility of the American commitment to South Korea's defense in the early 1970s, the government in Seoul began to pursue a nuclear weapons option. The United States opposed this policy and applied severe political pressure on the government to reverse this policy which it did in the mid 1970s. Since that time, the ROK has continued its non-nuclear weapons policy and is a signatory of the Non Proliferation Treaty and the International Atomic Energy Agency Safeguards Agreement. Although Korean nationalism is a very strong force, it is unlikely that any South Korean government will reverse this policy unless there is a major change in the American presence and/ or unexpected developments in the region.

Despite the severe economic problems confronting North Korea, it remains one of the most militarized countries in the world. Again, using 1998 statistics, North Korea had an estimated GDP of $14 billion, but yet committed almost $2 billion to its military or more than 14% of its GDP. The active duty forces exceed 1 million, and there are large reserve and paramilitary components available too. Approximately 70% of these active duty forces are forward deployed within 60 miles of the border with South Korea, and the DPRK has an extensive artillery capability that threatens Seoul, only 30 miles south of the Demilitarized Zone. Beginning in the late 1980s, American intelligence detected a suspected North Korean nuclear weapons program. Although the DPRK denied these reports, evidence mounted that such a program was underway. As tensions increased, the U.S. and North Korea entered into a series of negotiations that resulted in the Agreed Framework of October 1994 whereby the North Koreans promised to forego any nuclear weapons program in exchange for assistance in building two light water reactors for electricity generation. This project continues, and it appears that North Korea is fulfilling its part of the agreement.

The DPRK does have an active chemical weapons program, and there are estimates that between 2,500-5,000 tons of chemical agents are stored. Because of its large artillery force capable of striking Seoul and other parts of South Korea, this is major concern to both the ROK and U.S. It is also suspected that North Korea has conducted some biological weapons research, but because of climatic conditions on the Korean peninsula and an atrocious public health system in the DPRK, use of biological weapons could be extremely problematic. North Korea has gone forward with its missile development programs both for defense purposes and as a source of foreign exchange.

The Nodong missile, a variation of the old Soviet scud missile, can reach any point in South Korea. The Taepodong I is a three-stage missile with a range of 2,500 km, and the DPRK test fired a prototype over Japan in August 1998 which definitely got Japan's attention among others. The Taepodong II is currently under development and has a suspected range of 5,000 km. The 1998 Rumsfeld Report on ballistic missile threats to the United States designated the DPRK as one of the "rogue" states that the U.S. needs to take seriously, particularly as the Taepodong II comes on line. This report predicts the Taepodong II will be ready by 2003 and has become a major justification for the national missile defense program in the United States. During the latter stages of the Clinton administration, the two countries reached an agreement that in exchange for the lifting of some American economic sanctions and progress on establishing diplomatic relations, North Korea would not test any more missiles. However, since the Bush administration has taken a harder line on North Korea, it remains to be seen how long this agreement will remain in effect. The broader issue is that North Korea needs some sort of military threat to be taken seriously by the United States and other countries. How far it is willing to go in foregoing this type of threat is unclear.

Regional Issues

Northeast Asia remains a dangerous neighborhood and an area of concern for future arms control initiatives. Japan's historical legacy presents problems in its relations with China and the Koreas in particular. These countries watch warily for any sign that Japan may expand its military capabilities. The DPRK remains particularly hostile to Japan impeding efforts to improve its economy. Although the ROK established normal diplomatic relations with China in 1990, many Koreans are concerned about China's military modernization program. Increased Japanese and Chinese competition for influence could present problems for both Seoul and Pyongyang.

In the final analysis, the U.S. security arrangements continue to be critically important for regional stability. Reportedly, even Kim Jong Il acknowledged this impor-

tance during his summit with Kim Dae Jung in June 2000. If the United States decides for whatever reasons to change its security commitments with the ROK and Japan in particular, this development would have profound effects on the military policies of all regional actors with the attendant implications for arms control.

Future Scenarios Affecting Arms Control

Based on the political, economic, and military issues outlined above, there are a number of future scenarios regarding the Korean peninsula which likely will affect arms control initiatives. These scenarios are presented in the order of their most likely occurrence by 2015.

1. A unified Korea under South Korea control without nuclear weapons.
2. The continuation of the status quo with North Korea introducing some economic reforms along with external assistance that allows it to survive.
3. A unified Korea under South Korean control with nuclear weapons. As indicated previously, South Korea contemplated a nuclear weapons program in the 1970s but backed off under heavy American pressure. Events in the region or a reduction in the U.S. commitment could convince future Korean political leaders to pursue this option regardless of external pressure although the costs of so doing would be substantial.
4. A unified Korea under North Korean control. This remains highly unlikely unless the United States discontinues its dominant role in Northeast Asia, and even then, the ROK has sufficient capabilities to deny North Korea this type of success in reunifying the peninsula by force.

Major Conclusions

Russia will be trying to figure out who it is and to establish an identity for several more years. Russia is likely to continue "muddling through" as a weak, semi-stable, quasi-democracy through 2015. The Russian government will likely be able to control or contain major political, economic and military activities in the country. Although political and labor-related "hot spots" are likely to erupt, as they have in the past, such incidents are likely to remain isolated, with the Russian government retaining the ability to exercise at least "loose control" over the entire Federation. However, there is a chance that the geopolitical and economic system could destabilize radically, making our ability to conduct arms control operations much less predictable. It is also possible that the Russian government my not be able to maintain positive control of certain dangerous weapons materials. Overall, Russia is not likely to make significant progress in re-establishing itself as a dominant regional power, is not likely to realize a significant revival of its military, and is likely to lose regional influence to Western European countries, China, Japan, and to Islamic fundamentalism.

Politico-economic trends

Russia's future will depend, to a great extent, on how well the central government can steady the economic, political, military and regional chaos created by the attempted conversion to democracy and to free market economic principles. Russia is likely to undergo at least one more change in the presidency by 2015. President Putin's successors, however, are unlikely to differ radically from Putin's political ideology. They will wield significant power, tempered somewhat by the Duma and by international pressures. It is unlikely that the political climate, over next few years, will allow for a liberal president like Yeltsin.

The economy will play a major role in Russia's future. Despite official reports that the Russian economy is finally beginning to grow, there is little real faith in the Russian economy, and reinvestment in the Russian economy is slow in coming. Struggling to produce finished products of export quality, Russia has been selling off its natural resources, such as oil, just to keep afloat. The flailing Russian economy could quickly be thrust into a "crisis mode" if oil prices drop significantly.

One of the keys to economic stability in Russia will be a practical system of taxation. The average Russian believes that it is virtually impossible to "get ahead" playing by the rules. Bribery and tax evasion are a way of life. Russia is making progress in codifying a reasonable tax code and in tax collection, but the tax system is still being crudely managed and is inefficient. An estimated 60-70 percent of the Russian economy is operated on the black or gray market, and many of the transactions are barter deals, making tax collection very difficult. Tax collection is a major priority in the Russian government, and significant progress can be expected in this area by 2015.

The real wild card in Russia's future appears to be its powerful mafia(s). Corruption and graft have always been pervasive in Russia/Soviet society, but criminal and political mafias now control, or greatly influence, virtually all significant day-to-day operations in Russia. This powerful and corrupt segment of the Russian population will continue to bilk Russia of its reinvestment capital, making it extremely unlikely that Russia will be able to develop a progressive industrial infrastructure by 2015. While western governments and banks have loaned Russia billions of dollars to support its fragile economy and "fledgling democracy," approximately 20 billion dollars a year is leaving Russia in what is being called "capital flight." Russians, who have the means to do so, are not reinvesting in the Russian economy—they have little faith in the long-term viability of the Russian economy, and they have no faith in the rule of law or in the viability of long-term business without excessive government interference. They prefer to build up their foreign bank accounts and to buy property abroad. Despite numerous new laws intended to curb capital flight, Russians and foreigners have, so far, been able skirt those laws via legal loopholes as well as illegal means. The Russian economy is, in essence, a house of cards. It is being artificially propped up by loans, but Russia's foreign dept payments are likely to be unmanageable in the next few years. The payment will soon be over 15 billion dollars annually—roughly triple the Russian

defense budget. The moral decay, lack of ethics, and lack of trust in Russia will likely preclude Russia, and most of its people, from prospering economically by 2015. Additionally, another major downturn in the Russian economy is likely to kill off the small amount of hope that Russians still have in a sustained economic and standard-of-living improvement.

Complicating Russia's moral and ethical problems is pervasive government corruption. Although the Russian central government's rhetoric is strictly anti-mafia, often political and mafia leaders are one-in-the same, or at least cooperate with one another. As Russia gradually passes laws that institutionalize governmental and economic dealings, this chaotic relationship between mafia and government is, in practice, being codified. It is quite possible that, in the course of time, the relationship will be more than just "accepted;" it will be legitimized.

Up until now, the Russian Federation has had clear and undeniable political and economic incentives for cooperating on arms control issues. Cooperation, however, is not a "given." The United States Congress and new Presidency are viewed, in Russia, as "less likely" to continue the level of economic support that Russia enjoyed in the past. Despite gross corruption and misappropriation of economic aid in Russia, Russian hardliners blame the United States for Russian economic woes and for Russia's huge foreign debt. Additionally, Russia's relationship with western democracies is viewed as a zero-sum game by many Russian leaders, who have difficulty envisioning a win-win relationship with the West—particularly with the United States. Politically, Russians generally resent NATO expansion, U.S. plans to build an ABM system, and American dominance in general. Many Russian leaders continue to see arms control as an effective Russian bargaining chip in negotiations with the West, and this bargaining chip will likely continue to be played as Russia tries to maintain some semblance of "world power status." Also, Russia never has approached arms control in the "reverent" way that the West has—it's a much more practical approach in Russia. If the level of anti-Americanism rises in Russia, or if incentives for arms control cooperation are, in other ways, no longer perceived as outweighing the liabilities, then cooperation in the arms control arena may be withheld. Furthermore, as evidenced by the recent expulsion of Defense Threat Reduction Agency (DTRA) personnel, unimpeded access for arms control monitoring purposes is not a given in Russia.

In the unlikely event that the Russian Federation were to develop major geopolitical fissures resulting in serious regional declarations of independence, the international community would likely be forced to re-structure nearly all agreements, and deal with new governments. In that event, it is conceivable that some regions/ethnic groups in Russia would turn to the West for help in legitimizing their independence from Moscow, which in turn would further sabotage the West's relations with Moscow.

...Russian central government's rhetoric is strictly anti-mafia, often political and mafia leaders are one-in-the same...

Even if the Russian Federation remains intact, and regional tensions do not materialize, it is possible that the United States' and other governments may not be able to deal exclusively with the Russian central government matters related to arms control. Even now, Russian businessmen sometimes conduct business (to include military sales) in extra-governmental/extra-legal ways in order to avoid taxes, and to bypass internal or international export controls. If, as is speculated, this type of business includes nuclear, biological and/or chemical agents, then monitoring and dealing with these types of transactions is of critical importance. Monitoring such transactions will be complicated by Russian reluctance to cooperate with foreign investigative bodies.

Military

The Russian military, in general, is not likely to be increased appreciably by 2015. With the myriad of other economic priorities in the country, there simply is not enough money to initiate large-scale buying of military hardware. This is especially true when the costs of infrastructure maintenance and training are considered. The Russian military is more likely to be downsized even further in terms of personnel, hardware and viable facilities. However, Russia continues to perceive a threat from stronger Western powers and from China, as well as from its Islamic neighbors to the south. Just the war in Chechnya has greatly challenged Russia's conventional forces and encroached on the meager military budget. Realizing this, Russian military leaders have made it no secret that they will have to rely more on weapons of mass destruction to deal with the bigger threats. The Strategic Rocket Forces (SRF) are getting, and will likely continue to get, more than it's "fair share" of resources. While virtually no new conventional military equipment has been purchased in recent years, the SRF continues to field new upgraded equipment such as the TOPOL ICBM.

In all probability, chemical and biological weapons are, and will in the future, receive increased consideration along with nuclear weapons. Russia still has sizeable stockpiles of chemical and biological weapons. The location of most of these weapons is known—has been declared. Given the Russian propensity to deceive, however, along with the Russian realization that its conventional forces are inadequate to respond to the perceived threat, it is possible that Russian may have secret supplies, or may attempt to clandestinely assemble an arsenal of biological and chemical weapons. Numerous existing underground facilities could be used for such a purpose. Additionally, new underground facilities, such as the massive Yamantau complex, could be used for such a purpose.

Positive control of chemical, biological and nuclear materials will likely be a problem in Russia over the next several years. It is unclear whether the Russian central government really knows exactly how much of these materials exist in Russia; but even if they do, theft and illegal sales are a realistic possibility. There is clearly a market for these kinds of materials—especially in the Middle East. Russia has a history of clandestine military arms deals with Middle-East clients, and a more recent history of helping "rogue nations" to develop sensitive military technologies. According to Russia's own account, such help is not always state-sponsored, but is

arranged by shady Russian entrepreneurs. Furthermore, Russian military and security forces personnel, who maintain physical control of such materials, may not be trustworthy. Many are demoralized by their plight, their future looks bleak, and the prospect for "supplemental income" through the sale of such materials is certain to be a temptation for some. Additionally, Russian military commanders have been known to exploit/and or sell military assets to earn extra cash.

It is possible that Russia will use its conventional military forces to counter Islamic fundamentalist threats in and around central Asian countries, similar to what has been done in Tajikistan. Such a shift in military emphasis would likely cause Russia to deploy increased amounts of military hardware to that region. Considering the poor state of Russia's conventional forces, however, Russia may also consider the use of chemical weapons to counter regional threats if faced with a "desperate situation" such as the geopolitical erosion of the Russian state.

Russia has desperately tried to preserve and expand military ties with certain former Soviet republics. Russia has also made overtures toward India and China. Although a common enemy would probably be required before any significant military treaty/union with India or China could be realized, Russia has made some progress with some former republics in the Commonwealth of Independent States (CIS). Although no fundamentally different political or military relationship is anticipated with between Russia and the former republics, military relations could gradually progress over the next several years toward larger-scale exercises, which could include temporary larger-scale cross-border military deployments.

Demographics

The size of the ethnic Russian population in Russia is likely to continue its decline, largely due to a low birth rate resulting from economic and moral hopelessness. Because of poverty and environmental problems, the percentage of healthy Russians is also likely to decrease as well. Meanwhile, the average age of ethnic Russians is increasing, despite decreased life expectancy (the result of alcoholism and general despair). As a result, government social support systems for the elderly are likely to remain inadequate. There are also likely to be less able-bodied young Russians fit for military service, and since the upper strata of young Russians are generally able to bribe their way out of military service, conscripts will likely constitute, primarily, the lower strata of Russian young men. In general, demographics of the ethnic Russian population will contribute to the downsizing of the standing military.

As the ethnic Russian population contracts, minority ethnic populations in and around Russia are increasing rapidly. In coming years, ethnic minorities are likely to encroach more upon Russian politics and perhaps play a greater role in regional economies. The result will likely be increased friction between Russian and other ethnic populations. Despite years of forced "Russification," ethnic minorities in Russia were never truly integrated into Russian culture, and have, as a general rule, maintained their ethnic identity. Russians are inwardly and outwardly prejudiced against minorities, and the anticipated shift in the relative balance of power is likely to kindle ethnic tensions.

...proliferation of fourth generation and binary chemical weapons, and the advances in genetic manipulation of biologically active materials may supply the experimental data, equipment, and expertise necessary to produce smaller and more lethal weapons

Environment

Russia will continue to pay the price for decades of "irresponsible industrialization" through 2015 and beyond. The problems of radioactive, chemical, toxic and corrosive waste in Russia are well known, but certain areas could get worse. Aging and leaking containers may pose a significant threat to anyone in the area, to include installation guards/security personnel, the surrounding civilian population, and to on-site arms control monitors. Russia has "extended" the service life of many weapons, but maintenance is an acknowledged problem, and it is likely that such weapons, or their components/materials, will continue to be neglected as the Russian military stagnates in a "hunker down" mentality.

Technology

A technology breakthrough that would fundamentally alter Russia's economic or military posture is unlikely, and is beyond the scope of this study/think piece. Even so, due to decreased funding, dwindling markets, and aging research facilities, Russia's position in the high tech arena vis-à-vis western industrialized nations is not likely to grow. Russia's proven ability to steal sensitive technology and other information via espionage and spying, however, will remain a viable threat. Due to its cost-effectiveness, Russia is likely to sustain its efforts to "acquire" industrial and military technologies and to compromise sensitive monitoring protocols. It cannot be ruled out that sensitive elements of our arms control monitoring capabilities are, or will be compromised.

Russian defense industries, with tacit government approval, will almost certainly continue seeking foreign funding for research and development. Therefore, cutting-edge Russian military technologies will, by default, be "for sale," which may necessitate increased arms control monitoring in other countries as well.

Chemistry:
USAFA Cemistry Department

"All Our Tomorrows"

Phase I Input

Edited by
Maj Susan E Hastings

Contributors
Capt Jim F. Blankenship, PhD
Capt Jennifer S. Gresham
Capt Kyle D. Gresham, PhD
Dr Barry W. Hicks
Maj Luke A. Lorang
Maj Ronald C. Marks, PhD
Capt Daniel B. Ryan
Capt Curits L Weeks
Dr John S. Wilkes

Advances in chemistry will very likely change the face of future warfare. Significant chemistry advances that will impact the war-fighting environment can be categorized by technology or application. The following information has been grouped into Chemical and Biological Weapon (CBW) related technology, electrical power, and rocket propellants. Our list of potential chemical breakthroughs is not exhaustive. The majority of the information covers CBW because the majority of the department expertise falls in this area. Materials chemistry areas involving electronics and sensors need to be pursued further through AFRL. Initials of the author of each paragraph are included in parenthesis, and a key to these initial appears at the end of the document. (seh)

Recent advances in Chemical and Biological Warfare Agents

Over the next few years there could be significant advancement in the development and weaponization of chemical and biological agents. The proliferation of fourth generation and binary chemical weapons, and the advances in genetic manipulation of biologically active materials may supply the experimental data, equipment, and expertise necessary to produce smaller and more lethal weapons. (jfb)

Mass production of such weapons would be unlikely, however, as it would be difficult to obtain the large amount of instrumentation, materials, and chemical/biological expertise necessary without arousing international attention. Nevertheless, smaller, laboratory-scale facilities could relatively easily obtain enough material to produce a small terrorist-sized weapon. (jfb)

First, second, and third generation chemical agents are rather difficult to synthesize safely under standard laboratory conditions, and with the ratification of the Chemical Weapons Convention, the usual starting materials are now under close supervision and regulations. Biological agents, however, are much easier to obtain through overt and covert collection methods. Larry Harris, a member of a white supremacy group in Ohio, ordered a sample of plague from a US commercial source through the mail. It is not inconceivable that one person could covertly bring a sample of "hoof and mouth" disease back from Europe to devastate the US sheep and cattle industry. These are old, well known agents that can be made more effective with proper weaponization and genetic modification. (jfb)

Detection

One of the keys to defending against a CBW attack is early detection. Current field detection systems for chemical agents are based on ion-mobility mass spectrometry, a rather old and non-selective method of analysis. These spectrometers have become portable (the size of a Geiger Counter), but they often give false positives, especially when exposed to commercially available pesticides. (jfb)

Non-specific biological agent detection is now being accomplished with an instrument based on spin cycler technology. The instrument, slightly bigger than a briefcase, is currently being investigated for use as an automated warning system for large open areas, such as air bases. This system, however, does not identify the agent, which is critical in treatment of exposed personnel. Identification of the agent is accomplished by HUMMV-sized unit employing sensitive bioanalysis techniques, such as PCR, which unfortunately can take on the order of days to identify the agent present. (jfb)

Over the past few years the area of micro and nano-analytical instruments has been a hot area of development. The journal of Analytical Chemistry has had quite a few articles on the progress in this field. These instruments are etched on modified silicon wafers (the same as those used in computer chips), and depending upon the design, can be an inch or even smaller. These micro devices have been used primarily for chromatography-types of analysis, but it is possible that these instruments could be used to detect CBW agents in the field. The small size and relative low cost of these devices present an economical and militarily viable option to the expensive and heavy detection systems in use today. (jfb)

Enabling Technologies

In recent unclassified reports, the Aum Shinrikyo, prior to their Sarin attack on the Tokyo subway system, had attempted to use botulinum toxin and anthrax in the streets of Tokyo and Yokohama. There were no reported cases of botulinum or anthrax exposure because the release mechanisms, spraying the agents from rooftops and from the back of a moving truck, were extremely crude and inefficient. (jfb)

There are, however, commercially available methods to make the dissemination of such agents much more efficient and thus, much more lethal. Microencapsulation has been a technology exploited by the chemical and pharmaceutical industry since the 1950's. Microcapsules of biomaterial or liquid chemicals can be made from a variety of biodegradable plastics. These capsules, much smaller than the over-the-counter liquid cold capsules, allow the chemical or biological arms manufacturer to optimize the size of the capsules for inhalation-related dosage or allows for the inner material to be slowly released over a set period of time. Microencapsulation, as applied to biological weapons specifically, makes the dissemination of the agent much more efficient as well as protects the agent from damaging sunlight or other possible sources of disinfectant. (jfb)

Dissemination methods do not have to be overly complicated. Current agricultural sprayers are more than capable of providing adequate coverage of a target area, if the weather conditions are right. Some of these sprayers are even specially designed to spread live beneficial bioagents on crops. These sprayers would be ideally suited for limited biowarfare, such as acts of terrorism. (jfb)

Microencapsulation and agricultural sprayers are just two examples of how

commercially available technologies can be used to radically enhance the effectiveness of a small-scale biological or chemical weapon attack. Both technologies are not currently covered by counterpoliferation legislation and are widely available on the world market. (jfb)

A very simple, inexpensive Unmanned Aerial Vehicles (UAV's) could also be used as a platform for spreading chemical/biological agents. Radio-controlled airplanes are cheap and can be built and flown by children. The vehicle only has to be big enough to hold some agent and an atomizer. Any street will work as a runway and the RC airplane doesn't have to land to accomplish its mission. It could be very difficult to bring down such an airplane in an urban environment and would not appear to be a threat until too late. Imagine 100 of these RC airplanes flying over the Washington Mall during the 4th of July spraying chemical/biological agents and you have a potentially catastrophic situation. (kdg)

Biochemistry technology advances that may lead to biological weapons

Several near term biochemistry advances were identified that could provide new forms of chemical or biological weapons or chemical or biological defenses. (seh)

Real Time Polymerase Chain Reaction: Real time Polymerase Chain Reaction (PCR) would allow you to identify an organism through its DNA, most likely in biowarfare ops, in a matter of minutes. This would also be more reliable than a method that looks for specificity of proteins on the exterior of the organism. (jsg and bwh) The likely application of this technology would be biological weapon identification.

Molecular Biology: Molecular biology could be used to bypass biowarfare detectors/vaccines. There are two variations on this theme. One would be to analyze our vaccines, like the one for anthrax for example, and develop anthrax agents with mutations in the protein used in the vaccine. This would essentially make the vaccine worthless while requiring no major changes to the bacteria itself. The other variation is to take relatively harmless bacteria and give them virulent genes from other bacteria. On the outside, the bacteria would seem harmless and might bypass detectors while still doing considerable damage. (jsg and bwh)

Agent Neutralization: Agent defeat programs have traditionally looked at targeting and destroying agent production and storage facilities using high explosives to incinerate the agent. There has not been much (or any) research at conducting agent neutralization after the employment of a chemical/biological agent. This could be a last-ditch effort to save military and civilian lives after a battlefield dissemination or a terrorist attack at a major event such as a sporting event or political rally. Are there chemicals available that could neutralize a chemical and/or biological agent after it has been disseminated without itself posing a hazard? (kdg)

Selective Vaccines: Selective vaccines could be used by an enemy to make a vaccine for a particular agent they were planning on releasing, one that had not been seen exactly like this before. This would require the enemy to also mutate an existing strain, perhaps an influenza strain with important mutations to increase virulence. (Note: this strain would also be difficult to pinpoint as "biowarfare" per se, and thus the enemy might remain anonymous.) Once the enemy had vaccinated his own people, the agent could be released without harming his side. (jsg and bwh)

Fluorescent Biosensors: Fluorescent biosensors use could enable identification of biological agents using satellites. Imagine an airplane with a number of very small beads that serve as fluorescent biosensors, specific for some biological agent. The plane drops them over an area we suspect of producing or manufacturing biological agents. The beads would interact with the agent, yet would be small enough that people might not realize what had happened. The organism would fluores like a lightning bug when illuminated with the proper wavelength of light. Satellites or UAVs could then detect the resulting fluorescence, identifying either buildings or possibly people who were associated with the biological agents of interest. (jsg and bwh)

Chemical Tracers: A variant of this idea is the use of chemical tracer to track movement of mechanized forces and artillery pieces. The chemical would be invisible to the naked eye, but would fluoresce when illuminated with the proper wavelength of light (IR, UV). Daily flights by a UAV armed with a laser could perform wide-area illumination and record weapons movements with an onboard spectral sensor. (kdg)

Urban Warfare/Riot Control: Urban Warfare/Riot Control could be accomplished by disperse incapacitating or nauseating agents over crowds to disperse angry mobs or civilian insurgents. This would be most desirable in situations where non-lethal methods would be desired. Minimizes risk to ground forces in close quarters with armed mobs. (kdg)

Human Genome Project: When we've truly unlocked the secrets of the human genome, it will be relatively straightforward to use molecular biology to design virus's specific to certain ethnic groups or genders. Even without vaccination, the enemy would be safe, and the target would not. (jsg and bwh)

Electrical Power

Personal Electric Power: Sometime between the Vietnam conflict and the Gulf war the need for personal electric power by individuals (military and civilians) changed dramatically. In the last 15 years the power sources have gone from 39¢ flashlight batteries to $100 lithium batteries. The amount of energy contained in the batteries has risen in approximately the same proportion. In the next 15 years, there will be a similar need for a similar increase in electrical energy needs for individuals not tied to a fixed power source, but with a major decrease in weight. The technology to do this will be fuel cells with solid-phase hydrogen storage that are the size of today's notebook PC battery packs, but will have 10-100 times the energy. The effects on military logistics will be a 10X-100X less frequent re-supply cycle compared to today's best lithium batteries. (jsw)

Electric Power From Logistics Fuels: Diesel generators are a noisy, hot, heavy, inefficient, maintenance intensive way to convert stored chemical energy (diesel fuel) to electricity. Fuel cells are a quiet, cool, light, efficient, no-moving-parts way to convert chemical energy (hydrogen) to electricity. Diesel fuel and JP8 are logistics fuels; hydrogen is not. In the next 15 years fuel cells will be a viable means to generate electric power in stationary (command post and larger) installations and

for transportation (even electric airplanes). The breakthroughs will be in two areas; 1) development of small high efficiency reformers that will convert the logistics fuel to hydrogen, and 2) development of fuel cells that can use non-hydrogen fuels directly. The basic chemistries for both of those technologies have had laboratory breakthroughs recently, and field ready in 5-15 years. (jsw)

Rocket Propellants

Metastable Propellants: Rocket propellant research efforts seek to optimize specific impulse, molecular weight, stability and reliability. The ideal propellant would provide a high specific impulse and secondarily remain chemically stable under a wide range of environmental conditions so that rockets would not have to be de-fueled for launch delays. Aerozine-50, a 50/50 mix of hydrazine and monomethylhydrazine, which has fueled heavy lift launch vehicles such as the Titan IV, is an example of an environmentally stable liquid rocket propellant with a moderate specific impulse and represents a baseline for future improvements. Hydrazine-based fuels such as Aerozine-50 do not provide a high enough specific impulse to fuel the Titan IV upper stage for heavy or high orbit payload delivery. Liquid hydrogen/oxygen, which is not environmentally stable and must be removed and replaced for launch delays, must be used in these cases due to its very high specific impulse. (dbr)

As propellant research efforts come to fruition in the near term, we expect to see fuels that provide better specific impulses but will not meet the goal of being more environmentally stable. Researchers often refer to these emerging propellants as "metastable" or "preserved in cryogenic solids." We therefore predict that near term advances in rocket fuels will impact the battle space by significantly increasing payload capacity and easing access to distant orbits at a reduced cost per pound delivered. Higher specific impulse fuels may also make it feasible to launch heavy payloads into difficult-to-achieve orbits from Vandenberg AFB, CA rather than just Patrick AFB, FL. (Vandenberg AFB is more distant from the earth's equator.) However, we do not expect the next generation of high-impulse rocket fuels to be sufficiently environmentally stable to reduce launch preparation times, especially in the case of launch delays where the vehicle must be de-fueled. (dbr)

References:

bwh Dr Barry W. Hicks
dbr Capt Daniel B. Ryan
jfb Capt Jim F. Blankenship, PhD
jsw Dr John S. Wilkes
jsg Capt Jennifer S. Gresham
kdg Capt Kyle D. Gresham, PhD
seh Maj Susan E. Hastings

Economics

Global Issues 2015

Panel Discussion Members:
Lt Col Sohan (Panel Chair)
Lt Col Frank
Dr. Waller
Capt Carpenter
Capt Paik

Global Economic Outlook – 2015

While it may be true that a rising tide raises all ships, the size of the tide will vary across the globe. Increasing technology, more open global trade and increased access to information will be the major growth engines of the international economy as we move toward the year 2015. This growth will occur primarily in those countries that have the most access to the engines of growth, particularly in countries with free market economies and the rule of law. Poorer economies, those nations in transition from formerly socialist economies and those nations experiencing political upheaval or oppression will experience less growth compared to countries with more advanced, stable economies.

It is important to distinguish between the speed of growth and the size of growth. While countries often referred to as emerging markets may experience phenomenal percentage growth in per capita income, sometimes on the order of 15% per year, the world income distribution may become more unbalanced, since 4% growth in $25,000 per capita real income is greater than 15% growth in $3,000 per capita real income. To the extent that emerging economies continue their growth, the populations will be content that their economic situation is improving. To the degree that developing nations are aware of the growing inequality in world income distribution, this increasing income gap could become a destabilizing force.

The poorest economies may see the smallest amount of growth. These countries tend to be the victims of repressive regimes combined with fewer natural resources and a smaller capital base. These countries also traditionally suffer from poor educational systems. All of these factors result in slower growth. To make a long story short, the rich will get richer and the poor will be less poor, but continue to fall further behind the rich.

Areas of Concern:

Information Technology:

The increasing availability of information will have both stabilizing and destabilizing elements. Stabilization will occur with the increasing ease of technology transfer facilitating global economic growth. In addition, heightened awareness of the benefits of the market system and the rule of law will aid those countries saddled with less efficient markets and political structures. To the extent that existing regimes resist this process, tensions could develop. If developing countries are unable to sustain high economic growth rates, the population could become dissatisfied, particularly in those countries within the third quartile of the global income distribution. Countries in the top two economic quartiles will be relatively more satisfied with their lots and will lean toward more stability. Those in the lowest quartile will remain too poor to be any serious threat to global stability at other than a local level.

Western Europe and Japan are experiencing aging populations. Their generous social programs will put an increasing strain on the working age population and in the end will prove to be unsustainable.

Greater access to information and improvements in technology have made the production of weapons more economical. Smaller entities will now find it more feasible to produce relatively deadly weapons of mass destruction, whether nuclear, biological or chemical. While global stability may be increasing, fringe elements may be less stable. The likelihood of global conflict has decreased while the likelihood of local violence has increased.

Changing Population Patterns Within Countries and Regions:

Western Europe and Japan are experiencing aging populations. Their generous social programs will put an increasing strain on the working age population and in the end will prove to be unsustainable. Retirement ages will have to increase and benefit programs will decrease, leading to dissatisfaction among older generations.

The Middle East, on the other hand, is experiencing a rapid decrease in the average age of their populations. This has the potential to create a generation of relatively well-educated individuals with poor job prospects, fostering instability. This outcome is even more ominous given that younger workers in this region have typically been more closely associated with religious unrest. These concerns, coupled with the fact that many governments in the region are not democratically elected, could present a significant problem.

Immigration:

Less restrictive immigration policies could help reduce but not eliminate both the aging and declining population problems. Immigration may cause additional problems affecting both ends of the skill spectrum. Poorer countries tend to lose their most skilled workers to more advanced economies drawn by the prospect of greater monetary compensation. This "brain drain" tightens the downward economic spiral the countries fight to overcome. In addition, immigration will tend to displace lower skilled workers within the receiving country causing wages to fall for the lower skilled workforce. The result is increasing wage dispersion and dissatisfaction within the receiving countries. Immigration has the potential to alter the demographic patterns within the receiving country placing greater stress on their political and social systems.

Natural Resources:

Energy shortages have drawn considerable media attention recently. We feel this should not be a real problem for the near future. Energy production and distribution, particularly on the international trade level, has largely been left to market forces. As greater amounts of oil are discovered in non-OPEC nations, there should be no reason to have any sustained increases in energy prices as we move toward 2015.

Of greater concern is global water usage. Governments have tended to take responsibility for water allocation. While the global water availability was relatively stable, the tendency of governments to severely mismanage resources was overlooked. As regional water shortages appear,

particularly in areas with rapidly increasing populations, this tendency toward bureaucratic mismanagement will only intensify the problem. Governments will be too slow to efficiently and correctly react. For nations relying on the government or bureaucratic food distribution, these same inefficiencies may become a problem.

Environment:

Damage to the environment tends to be a symptom of local problems and tensions rather than a necessary byproduct of economic growth. As an economy becomes more advanced, there is a tendency for its population to demonstrate greater concern for the environment. Hence, the best cure for environmental problems is economic growth.

Regional Trouble Spots:

Unrest will primarily occur in countries in the third income quartile. There is a temptation for governments to export their economic troubles in terms of increasing regional tensions designed to divert attention away from domestic problems. In this scenario countries often attempt to blame their problems on outsiders rather than the true cause - governmental mismanagement.

China:

The Chinese may have trouble sustaining their recent growth. They would desperately like to have increased international trade but have demonstrated a lack of respect for intellectual property rights. This will slow their entrance into the WTO. Their recent altercation with the United States may jeopardize their MFN status. Taiwan continues to plague US – China relations. China may seek to redirect attention from internal economic hardships by exerting military influence in the region.

India/Pakistan:

India will have a difficult time sustaining its economic growth. They too have demonstrated a blatant disrespect for intellectual property, which reduces their ability to increase international trade. They have a rapidly increasing population, are mired in a stratified culture, and struggle under the weight of an oppressive governmental bureaucracy. Pakistan and India will be convenient scapegoats for one another during the foreseeable future. The presence of nuclear weapons on both sides complicates the situation significantly.

Israel and the Middle East:

Peace in this region seems implausible. However, with the exception of Iraq, the likelihood of a major economic disruption in the region is small.

North Korea:

North Korea is in dire economic straits. Their economy is poised on the brink of collapse. It is difficult to judge what will happen there. In the absence of any significant ideological or economic change, they will continue to fall further and further behind the rest of the world. Aggression on their part to counteract their economic failure is not out of the question.

Former Soviet Union:

Each of these nations has its individual problems. Most political entities are saddled with the yoke of bureaucracy from the failed communistic experiment. If these nations can successfully transform themselves into market economies under the rule of law, they will succeed and prosper. Unfortunately, vestigial bureaucratic structures have transformed themselves into a culture of organized, almost legitimized, graft and corruption. Unless property rights are ensured, these states are doomed to failure and will likely attempt to blame this failure on the market economies of the world. This region will also suffer from capital flight; both physical and human (brain drain). Due to the limited resources available to the countries, conflicts here will most likely be regional. This region is in possession of tremendous natural resources that have largely been squandered by ill-advised government policies.

Sub-Saharan Africa:

Crushed by disease, corruption, internal and regional strife, this region may never see sustained economic development. In general, these countries are too weak and overcome by internal conflict to affect the rest of the world.

Most Likely Situation in 2015:

While the world will still be subject to the business cycle, the general trend will remain one of continued economic growth. The major economies of the world will grow fastest. The United States will remain the dominant economy. Europe will benefit from the European Union. Japan will eventually correct its economic missteps and continue to grow.

An individual nations' economic growth will depend upon adherence to free market and trade principles. The rule of law and respect for property rights are the key to development and growth. The international economic hierarchy demonstrates this fact. Growth, derived from these very principles, will be greatest in the largest economies.

The greatest instability will occur in the third quartile of the global economic distribution. Countries at the lower extreme of the economic spectrum will be too weak to disrupt the global economy. Regions of conflict will be characterized by nations having the potential for increased growth but stymied by governmental policies and interference. The increase in global information will cause dissatisfaction in their populations and may lead to local and regional altercations.

Alternative Scenarios:

Sustained Global Economic Recession:

While a sustained global economic recession is highly unlikely, recession in the United States, the European Union or Japan may spread to other countries. Normally, free-floating international monetary exchange rates help prevent the full impact of recessions from spreading across international borders. However, the European Monetary Union eliminates this cushion. In addition, many smaller countries find it in their best interests to link their currencies to one of the primary international currencies. As a result, a recession in the primary currency area could spread to every country using that currency as its standard. Sustained recessions are more likely to occur in Japan or in the European Union as opposed to the United States. This risk stems from their changing demographic structure and draining governmental social support structures.

Major Middle East Conflict:

The risk of a major religious upheaval in the Middle East is always a potential threat to global stability. While this will cause a temporary energy crisis, there are enough alternative oil sources worldwide to compensate. It may be difficult for the U.S. to avoid entanglement in such a situation. Water crises in this region are also a significant danger.

Failure of China or India to Sustain Growth:

Either of these situations is possible and should be monitored closely. If

economic growth falters and unrest ensues, a major regional conflict could develop especially if a country acts externally to pass the blame for its troubles.

Regional Factionalization:

While free trade increases the welfare of all countries involved, regional free trade agreements may potentially undermine global free trade. To the extent that regional free trade agreements increase trade, the world is better off. If regional agreements divert trade from one region to another, net international welfare may decrease.

It is likely that regional free trade agreements will be trade increasing since countries already tend to trade with those countries in geographic proximity to themselves. However, any trade diversions could cause regional tensions and may result in trade wars, or worse. Global tensions would be diminished to the extent that the WTO can help avoid these situations.

If regional factionalzation occurs, the expectation is that political tensions will increase. This has the potential to spread into other regional trade zones. With increased globalization, countries will have closer economic ties than political ties. International trade regions will become more of a factor in international politics. The European Union is an excellent example, particularly with respect to its relationship with NATO.

Physics &Nuclear/

Radiological Science:

Lt Col Geoff McHarg
Major Mike Dearborn
Capt Andy Dills

Introduction

The Institute for National Security Studies (INSS) tasked our panel to provide the Physics and Nuclear/Radiological input for a study who's objective is to "… identify a broad range of interdisciplinary global trends, and the resultant technology issues, affecting the arms control environment in the year 2015." This resulting report tries to answer that tasking while straying a bit into technology investment recommendations that are perhaps more appropriate for a future trends in defense technology rather than arms control technology study.

We decided not to summarize and revisit the basic ideas presented in other future trend reports, but rather concentrate on important scientific trends and technologies that we feel have not been given sufficient attention in these fine documents. We do however recommend the reader to the Central Intelligence Agency report "Global Trends 2015: A Dialog About the Future with Nongovernmental Experts," http://www.cia.gov/cia/publications/globaltrends2015/, and to a somewhat lesser degree the Air Force 2025 Study, http://www.maxwell.af.mil/au/2025/. To some extent this decision renders our report somewhat narrow in focus, and some would say low in probability. We understand and accept this criticism, but believe this narrow focus allows us to contribute something new to the "future studies" type document, which All Our Tomorrows certainly is.

We understand and assume that familiar technologies under consideration are important, and will be developed--we simply choose not to discus these in this report. Such technologies include Hyperspectral sensors, Moving Target Indicator (MTI) to include various radar and electro-optic sensors, Global Positioning Satellite (GPS) guided munitions and the directed energy weapons such as the Airborne Laser (ABL).

To explore these scientific trends and technologies we use two basic example scenarios. The first of the two scenarios is is a decrease in effective world governance, followed with a dramatic increase in global terrorism. The second is a rising East/West tension and possible conflict with Sino-forces. These scenarios are not seen as particularly probable, but do allow a convenient forum for discussion of the trends and technologies we have selected for study. In particular both scenarios present asymmetric challenges to the United States in terms of arms control and defense. We feel that such asymmetric challenges will be ever more probable as other countries and organizations come to understand they cannot compete with the United States on our terms.

Overarching both of these scenarios is a common scientific thread, which we feel has not been given enough consideration. Global climate change will become an important driver in the geo-political climate in the next 15-20 years. We begin by discussing the basic science associated with global warming, and then turn to how it effects the security situation around the globe

.

Basic Science Trends--Global warming

The basic science behind the greenhouse effect of the atmosphere has been understood since the time of the French scientist Jean-Baptist Fourier in 1827. The idea behind the greenhouse effect is that long-wave (infrared) radiation emitted from the earth which has been warmed by the visible portions of the suns light is absorbed and re-emitted by the so called greenhouse gases in the atmosphere. Water vapor, carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) are called greenhouse gasses because they mimic the function of glass in a greenhouse, the effectively reflect long-wave radiation (heat) back to the Earth. Incorporating their concentration in the atmosphere and their relative "insulating" characteristics can compare the importance of the greenhouse gasses. When this is accomplished water vapor is found to be the dominant greenhouse gas. While human activity causes on small changes in the concentration of water vapor, the anthropogenic (human activity) increase on the other greenhouse gasses are substantial. Indeed as early as 1896 a Swedish chemist named Svante Arrhenius calcu-

lated the effect on the global average temperature if the dominant greenhouse gas of carbon dioxide were doubled. Today this increase in carbon dioxide and other greenhouse gasses is understood to be due to human industrial activity, especially the burning of fossil fuels. An excellent primer on the basic science can be found in "*Global Warming*" by John Houghton.[1]

The increases in global carbon dioxide concentrations in the atmosphere are readily detectable from both ground and space based observations. The increase of carbon dioxide concentrations in the atmosphere from roughly 280 parts per million by volume (ppmv) in the pre-industrial era of 1700 to over 360 ppmv today can be deduced from the historical record. These results are determined through a combination of ice core measurements made in Antarctica and direct measurements made at the Mauna Loa observatory in Hawaii.[2] Indeed a recent report comparing global infrared measurements made by two similar instruments, which flew on spacecraft 27 years apart (1971 and 1998), reveal a global increase in CO_2 concentrations seen in the outgoing longwave radiation of approximately 0.6%.[3]

There is little argument among the scientific community that increases in atmospheric concentrations of greenhouse gasses will eventually be accompanied by increases in temperature. Whether these increases in temperature can currently be detected above the natural variation of such measurements is less well resolved. Reasonable people disagree on our current ability to detect global warming resulting from increases in greenhouse gasses. The most recent Intergovernmental Panel on Climate Change (IPCC) report issued in 1995 is worth stating in full.[4]

> *"Our ability to quantify the human influence of global climate is currently limited because the expected signal is still emerging from the noise of natural climate variability, and because there are uncertainties in key factors. These include the magnitude and patterns of long-term variability and the time-evolving pattern of forcing by, and response to, changes in the concentrations of greenhouse gasses and aerosols, and land surface changes. Nevertheless, the balance of evidence suggests a discernable influence on global climate.*

If uncertainties and disagreements are present with regards to the current ability to detect global warming they abound when it comes to the ability to predict what longer-term effects will be on the global climate. Indeed recent studies indicate that the full effect of global warming due to increases already in the atmosphere may not be evident for another 20 years.[5] This is mainly due to the complicated problem associated with modeling the global climate. A successful model must contain all the important physics that describes the sources, sinks and interactions of different greenhouse gasses. For instance both the soil and the ocean serve as a very large, but dynamic, source and sink for carbon dioxide, with proper modeling of the biota (living organisms) required for both ecosystems. Modeling of the biota is an example of the importance of feedback mechanisms to understanding this problem.

...the potential effects of climate change directly effect the geo-political global scene.

Since water can absorb carbon dioxide, carbonated drinks prove this point, the upper 100 meters or so of the oceans serve as a very important sink for CO_2. However full three-dimensional modeling of the ocean is required to properly include the effects of mixing of this upper surface water with the much deeper oceans. When this modeling is accomplished we find a positive feedback mechanism indicated such that increased temperatures reduce the ability of both the soil and oceans to absorb CO_2, thus increasing the future warming by some 10-20%.[6] This is just one example of the difficulties associated with attempting to resolve the effect of increases of anthropogenic greenhouse gasses.

Importance of climate change as a global geo-political driver

Given the uncertainties in the modeling, in addition to the politically charged nature of the global warming controversy the logical question to ask is why worry about including it in All Our Tomorrows? The simple answer is that the potential effects of climate change directly effect the geo-political global scene. In addition there is little scientific dissent that such changes will come, the arguments occur on the rapidity and the location of these effects.

Global climate change is more than simply raising the average temperature around the world. Distinct effects have already been identified which greatly complicate the regional assessment of political and economic trends and the military futures of those regions. Figure 1 shows the results of two different models, which show the geographic distribution of temperature increases.[7] The upper panel of Figure 1 shows the results of a transient fully coupled atmosphere-ocean general circulation model (TAOGCM, the state of the art in such models) run for the year 2000. The colorbar on the right of the panel shows the change in the temperature in degrees Celsius from start of the model. The lower panel shows a more simple (more computer efficient) model run for the same radiative forcing and time period. While the interested reader is referred to the article the lower panel can be thought of as the geographical distribution of temperatures in approximately 2020. Notice that most of the temperature increases are in the higher latitudes, and have regional variations. In conjunction with increased temperatures are changes in sea level, fresh water precipitation, runoff, and eventually soil moisture.

The results of these changes to future geopolitical calculations can be appreciable. Consider for instance one of the primary drivers considered in the CIA Global Trends 2015 report.9 In the Natural Resources and Environment section the report predicted that overall food and energy supplies would be adequate on the global level, but poor infrastructure and distribution, political instability and chronic poverty would lead to regional imbalances (especially in Sub-Saharan Africa). They further point out that in contrast to food and energy fresh "water scarcities and allocation will pose significant challenges to governments in the Middle East, Sub-Saharan Africa, South Asia, and northern China. Regional

tensions over water will be heightened by 2015." This assessment apparently does not consider any effect from global climate change.

We suggest that given the current state of scientific knowledge, continued ignorance of the regional effects of global climate change on future world scenarios is unwarranted and ill advised.

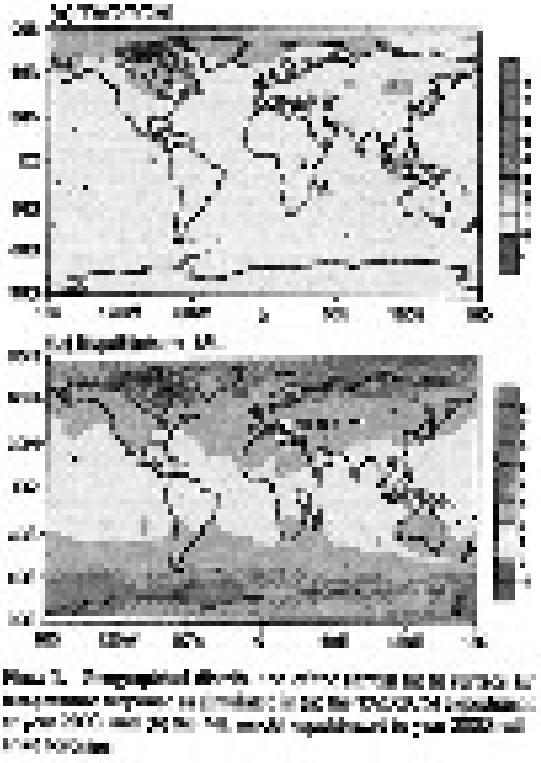


Figure 1 from Wetherald et al., 2001, Plate 1

Table 18 identifies several of the associated water related effects of global climate change, the positive or negative impact, and the regions most susceptible to that particular type of change.

Two scenarios to introduce technology trends

We turn now to some specific technologies we think merit attention with respect to the arms control and international security environment of 2015. We report on advances in electromagnetic compression in basic nuclear physics in our first scenario, which deals with an increase in global terrorism. We then follow this with a scenario describing a possible conflict with China, and detail how emerging technologies may fundamentally change the security status in such a conflict. In particular we concentrate on the enabling technologies of MicroElecroMechanical Systems (MEMs) for development of highly miniaturized sensors. In addition we feel broadband free space communications and directed energy weaponry may allow significant advances in Unmanned Aerial Vehicles (UAV's). These three enabling technologies were chosen because they have not been given premier status in other reports, and we believe they are as important as other more familiar technologies.

Decrease in effective world governance, followed with a dramatic increase in global terrorism

Assumptions: Governance in some currently nuclear capable countries deteriorates to the level where terrorist organizations acting in concert with criminal groups can obtain small amounts of fissile material, entire nuclear devices or other materials required for weapons of mass destruction.

While this is an admittedly small probability scenario we chose it because it points out the fundamentally different problems associated with proliferation when a non-governmental organization is the one developing or using a weapon of mass destruction.

When we assume that terrorists can obtain either some small amounts of fissile material, or worse yet an actual device, the proliferation problem is radically changed. We move from prevention of obtaining the technology, to produce the fissile materials and then the device, to a problem of how to prevent use of the device. This appears to be a much more challenging problem.

For instance delivery of a device is eased for the terrorist when one can attempt to sneak it into the target country on ship or truck. While our group claims no expertise in the area of nuclear device detection, research into detection technologies suitable for use in ports; rail crossings and road entry points are clearly important. Such research should be immediately started in not currently underway.

In addition even small amounts of fissile material can potentially be very devastating when considering the contamination they could cause. A conventional explosive on the order of the Oklahoma City bomb (approximately 1 ton of TNT) combined with powdered fissile material would cause a large contamination problem. Indeed one can envision a terrorist using a slightly larger conventional explosive at the waste storage facility of a commercial nuclear plant to achieve the same effect.

Type of Effect	Primary Results of Effect	Primary regions affected
Sea Level Rise	**Flooding of delta regions**	**Netherlands, Bangladesh, Eastern China, Central US**
Increased precipitation/runoff	**Flooding in some places, increasd crop porduction n others**	**South East Asia, high latitudes in Winter**
Decreased precipitation/runoff	**Drought or desertification**	**Central US, Southwestern Europe Sub-Saharan Africa**

While advances in basic nuclear physics are high tech they continue to offer the possibility of sub-critical or even critical explosions with extremely small masses of fissile material. Most of these ideas rely upon the basic idea that the critical mass for a nuclear explosion scales with density ( ) as ~ .10 Thus the normal requirement for approximately 16 kg for an unreflected Solid liner implosions are typically hollow shell z or theta pinches which use the mass of the liner to prevent vaporization during the implosion. Problems with such implosions include that a spherical implosion is difficult to achieve, and nonuniformities in the implosion can cause the compression to tear apart. Such difficulties have been overcome however, with reports of greater than 6 times solid density being achieved for a small portion of the implosion.15 In addition the use of a hot hydrogen working fluid has been theoretically investigated. "The advantages of a working fluid include decoupling of outer implosion uniformities from the central implosion and the possibility of transferring non-spherical liner energy onto a spherical target."16

While such experiments are certainly futuristic, and currently require large complex experimental apparatus, the possibility exists of using explosively driven magnetic flux compression generators to drive them. These generators take chemical explosive energy and turn it into a one shot high current electrical pulse of energy perfect for running such an implosion. Indeed Mokhov discussed calculations of a spherical shell liner driven in such a manner and presented experimental evidence that such investigations were underway in the Soviet Union in 1979.17

Even more exotic are ideas to use a small number of antiprotons to catalyze a subcritical microfission/fusion device.18 While the device was intended to serve as the power source for a high thrust, high ISP outer solar system space drive, the quoted results are a terrorist's dream. The calculated yield was 390 GJ (0.1kT, or about 100 Oklahoma City bombs), with 98% of the energy released in prompt radiation and neutron kinetic energy. The actual device design used only 3 grams of nuclear fuel (molar ratio of 9:1 DT:U235).19

The reader should understand we do not project such devices being available to the common, or even uncommon terrorist, by 2015. However even small advances in technology might significantly reduce the amount of fissile material required to make a particularly nasty terrorist weapon. After all the best terrorist weapon is one that kills a moderate number of people, leaves a huge cleanup mess, and leaves more people alive to be afraid of further terrorist actions.

This section was intended to lead the reader to consider whether conventional arms control techniques are appropriate when considering use of nuclear and nuclear related weapons by a non governmental organization who's main intent is the spreading of terror. This discussion indicates that mitigation effects after the fact of such a terror attack are prudent, and research on decontamination techniques in urban areas is warranted.

Rising East/West tension and possible conflict with Sino-forces

Our second scenario is more closely related to the international security environment of 2015.

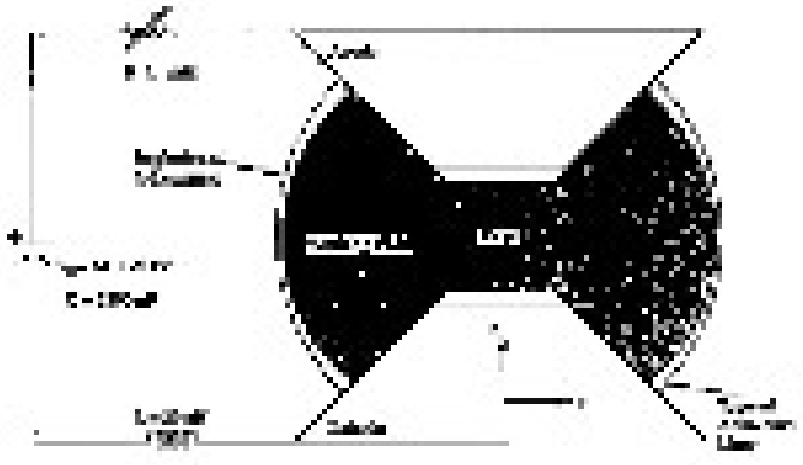
Assumptions: Greatly increased tensions between the West and China, resulting in a conventional, but very asymmetric, war on either the mainland (more probably Korea or less probably the border with the former Soviet Union and us being dragged into the conflict) or across the South China Sea with Taiwan.

In either case the resulting conflict would be very challenging for the United States. History indicates that the Chinese would use large numbers of moderately trained troops equipped with moderately sophisticated weaponry. In both examples we would be have very little room for defense in depth, and are forced into trying to stop an attack before it is delivered home.

Planning for this type of war has been very taxing for the United States. Our forces in Korea and Japan are structured so we can withhold such an attack for a sufficient time to bring follow-on forces to the region and prevail by cutting the lines of communication on the Korean peninsula. An attack across the Sea of China into Taiwan is much more problematic for us. We have little in the way of dedicated forces available, and the distances and terrain involved are much more in China's favor.

To overcome these disadvantages, while minimizing a build up in US long-term dedicated forces, requires a breakthrough in the way we plan for such a conflict. One possible solution is the use of an unmanned combat air vehicle (UCAV) with variable payloads suitable for missions ranging from surveillance, suppression of enemy air defense, strike and interdiction, air superiority, and missile intercept.

The required technologies for many of the engineering challenges of UAV's have been reported on in past studies. In this report we choose to explore the new scientific breakthrough technologies related to possible payloads for these UAV's. Specially we discuss the enabling technologies of MicroElecroMechanical Systems (MEMs), broadband free space communications, and directed energy weapons. We will not discuss these technologies in great detail, but choose to pro-



vide references to work being done in these areas. We end this brief discussion with a possible scenario, showing how the technologies are related, and can have a potentially revolutionary effect on the battlefield of 2015.

MEMs are given a good description on the DARPA webpage.20
MEMS to date have evolved from the fabrication technologies used for semiconductor devices. The ability of MEMS to gather and process information, compute a course of action, and control the environment or a macro system through actuators increases the affordability, functionality, and performance of smart systems. The enhanced capability of smart systems enabled by MEMS increasingly will be the product differentiator of the 21st century, pacing the level both of defense and commercial competitiveness.

Advances in MEMs technology are extremely rapid right now. The commercial market due to the many civilian applications is fueling these advances. We project their advancement to be very rapid, and bring about a fundamental change in the size and capability of future sensors and weapon systems. Indeed it is possible to envision entire sensor packages on the hundreds of micron scale size. Such sensors would probably have one designated mission, but due to their small size and cost literally thousands of the sensors could be carried in a macroscopic payload. One could envision saturation of critical areas with miniaturized sensors or weapons for specific applications.

One of the advantages of a UCAV is that it can be made smaller since there is no longer the restriction of being able to put a human in the aircraft. Miniaturization of the systems onboard the UCAV are a driving factor in increasing capability while reducing the mass and volume. We believe that MEMs represent a major change in the way weapon systems of the future will be developed.

The second critical technology is broadband free space communications. Global Hawk, a current experimental UAV, has a line of sight communications bandwidth of approximately 274 megabits per second, and a SATCOM bandwidth of only 50 megabits per second using a Ku band system.21 Such a capability while seemingly impressive is actually far short of what is required. A live feed at standard TV frame rates (30 frames per second) with a 1000x1000 array sensor digitized at 12 bits is seen to be approximately 360 megabits per second. A useful reconnaissance platform will need the capability to support several such data feeds over long distances. A bare bones requirement would seem to be in the realm of several gigabits per second per platform. Current technology is approaching this mark over limited ranges using laser communication techniques.22 While none on our panel claims expertise in such technology it seems to be a critical limiting technology in getting people out of the cockpits of future aircraft.

The final technology area we briefly discuss is that of directed energy. Currently the Air Force is fielding the first airborne laser (ABL) weapons system. The first generation device relies on a chemical oxygen iodine laser mounted in a 747 aircraft capable of several hundred kilometers range.23 These systems were designed specifically to provide a limited defense against theater missiles, and are scheduled to come into the force in 2007. One limiting factor on the range of the ABL is correction for atmospheric turbulence, and atmospheric absorption.

In addition to the use of Infrared (IR) lasers, is the possibility of both non-lethal and lethal microwave weapons. These weapons use a short pulse of current to drive a very high power microwave generator. Such an arrangement is very suited for use with an explosive magneto cumulative generator discussed in the previous section. In this manner a microwave weapon would turn the energy in explosives into electromagnetic energy which could be used to destroy enemy radar, electronic surveillance equipment etc. This type of weapon might allow very small munitions for use in SEAD missions.

The common thread behind the technologies is the development of a multi-payload UCAV for remote power projection around the world. Such an aircraft would be designed to be very stealthy, and extremely high-flying (technology to support long duration aircraft at ~35,000m is currently being discussed by NASA24) in order to defeat the capabilities of current and future air defense technology. MEMs would be used extensively in the onboard systems and payloads in order to minimize the size of the aircraft. Specialized micron sized sensors would be dropped from the UCAV and be used to provide passive in-situ intelligence estimates within the enemy country. These would be one-use nano-sensors that would be almost impossible to find, negate or jam due to their size and number.

Wide bandwidth would be required to allow full two-way data transfers which would include multi-sensor feeds for the nano-sensors as well as control inputs for the UCAV from the remote operations site. The great circle distance between the central US and the Chinese coast is approximately 10,600 km. Assuming the UCAV range can be extended over that of Global Hawk by approximately a factor of 4 would allow central positioning of the UCAV assets within the US. This is true global reach, no forward deployment, no last minute redeployment, no refueling, just find and then strike the target and go home.

One technology obstacle to overcome is the travel time of radio waves from the central US around the world. The round trip time to and from geo-synchronous orbit is on the order of 0.3 seconds, which might preclude remote combat operations. A string of high-flying communications relay UAV's could reduce this travel time 0.07 seconds to any point on the globe. Such a relay system would require the wide bandwidth discussed above. We anticipate some sort of cryptography using quantum or chaotic principles will need to be developed to provide secure communications.25-26

Once hostilities had broken out, both SEAD, strike and air superiority functions would be required. The SEAD missions would best be served with and explosively driven microwave weapon which would act as an "EMP bomb" to take out enemy acquisition radars. The air superiority functions using a UCAV would be significantly different from that of manned aircraft. Rather than engaging enemy forces one on one in a traditional maneuver engagement followed by firing a missile or gun at the enemy27, the UCAV would be used to shape the air combat by employing its enhanced altitude and stealth characteristics to remain unseen and unassailable.

Strikes on enemy airfields and

supply depots would be the best way for the UCAV to gain air superiority. The best way to take out enemy aircraft is before they launch. Reality however dictates that some enemy will have to be destroyed in the air. To do this the UCAV could use a very small stealthy gravity assisted munition to take out enemy aircraft. Assuming the UCAV can remain unseen it can position itself with respect to the enemy so that it can "drop" an aerobody munition on the enemy aircraft. This weapon would use the energy gained from dropping from the UCAV altitude to maneuver horizontally so it is behind the enemy flight. When at the proper altitude, the munition would explode into several small passively guided terminally powered missiles and take out the enemy aircraft. Such a scenario is more analogous to submarines shooting torpedoes at ships that never detected them, rather than traditional fighter maneuvers.

The strike portion of the UCAV capability would also use the aerobody concept to maneuver the bomb during the terminal portion of its drop directly onto the target. These very precise strikes would allow the use of small advanced munitions to take out many targets at once. We expect increased energy would be required to kill shipping targets, which would reduce the numbers of weapons that could be carried in each aerobody munition for these missions.

The final mission we envision for the UCAV is as a relay platform for an ABL. As mentioned before the limiting factors on ABL range are atmospheric turbulence and
atmospheric attenuation. Both of these effects will be reduced in the reduced density of the upper atmosphere where the UCAV will be flying. If this proves to be the case then the ABL can afford to standoff at a further range, reducing its vulnerability to enemy forces, and increasing the area it can protect. Such a relay system would consist of a sensor package extending the detection range for the ABL, a deformable mirror system that intercepts the beam from the ABL, and a small onboard laser system needed to probe the atmosphere between the UCAV and the target. Obviously this kind of relay system would entail more risk than simply using the ABL by itself, and use of an unmanned vehicle for the "target" vehicle on the relay might be warranted.

Conclusions

In this report we have looked at the important general scientific trend of global warming, and the enabling technologies of MicroElecroMechanical Systems (MEMS), broad band free space communications, and directed energy weapons. Our principle recommendations for development of scientific research and technology developments in the arms control and international security arena of 2015 are:

Incorporation of global warming trends in future geo-political analyses

Technologies to detect nuclear devices in non conventional delivery systems such as ships and ground transports

Radiological decontamination and cleanup technologies for urban areas

Continuing assessment of electromagnetic compression and other techniques which significantly reduce the amount of fissile material needed for a nuclear device

Development of a high altitude UCAV capable of multiple missions using multiple payloads. The enabling technologies for this are:

Development of MEMS for miniaturized one shot sensors and weapons

Development of broad band free space communications and associated cryptography

Development of one shot explosively driven microwave weapons

Development of aerobody munitions which convert gravitational potential energy into lift for horizontal maneuver

Development of a high energy laser relay system for a UCAV to extend the ABL range

END NOTES

1 *Global Warming: The Complete Briefing,* Second Edition, John Houghton, Cambridge University Press, Cambridge, U.K., 1997.

2 Houghton, page 25.

3 J. E. Harries, H. E. Brindley, P. J. Sagoo, R. J. Bantages, Nature, 15 March 2001, pages 355-357.

4 *Climate Change 1995: The Science of Climate Change*, eds. J.T. Houghton, L.G. Meira Filho, B.A. Callender, N. Harris, A. Kattenberg and K. Maskall, CUP, 1996, Summary for Policymakers.

5 R.T. Wetherald, R.J. Stouffer, K.W. Dixon, Geophysical Research Letters, 28, 2001, pages 1535-1538.

6 P. Friedlingstein, L. Bopp, P. Ciais, J. Dufresne, L. Fairhead, H. LeTreut, P. Monfray, J. Orr, Geophysical Research Letters, 28, 2001, pages 1543-1546.

7 Wetherald et al., 2001, Plate 1

8 Taken from Houghton chapters 6 and 7, and from Wetherland et al., 2001.

9 *Global Trends 2015: A Dialog About the Future With Nongovernment Experts,* CIA, 2000. See http://www.cia.gov/cia/publications/globaltrends2015/.

10 *The Los Alamos Primer: The First Lectures on How to Build an Atomic Bomb,* Robert Serber, University of California Press, 1996, page 27.

11 *Nuclear energy: an introduction to the concepts , systems, and applications of nuclear processes*, Butterworth-Heinemann, Woodburn, MA, 2001, page 421

12 J.H. Degnan, M.L. Alme, W.L. Baker, J.S. Buff, C.B. Boyer, C.J. Clouse, S.K. Coffey, D.W. Conley, D. Dietz, J.D. Graham, S.L. Gonzalez, K.E. Hackett, D.J. Hall, J.L. Holmes, E.A. Lopez, W.F.McCullough, D.W. Price, R.E. Reinovsky, N.F. Roderick, P.J. Turchi, and J.M. Welby, in Megagauss Technology and Pulsed Power Applications, edited by C.M. Fowler, R.S. Caird, and E.J. Erickson (Plenum, New York, 1987), pp.699-706.

13 J.H. Degnan, W.L. Baker, J.D. Beason, C.J. Clouse, D.Dietz, D.J. Hall,

J.L. Holmes, D.W. Price, and C.R. Sovinec, in in Megagauss Technology and Pulsed Power Applications, edited by V.M. Titov and C.A. Shvestsov (Plenum, New York, 1990), pp. 623-630.

14 P-R.Chiang, R.A. Lewis, G.A. Smith, J.M. Dailey, S. Chakrabarti, K.I. Higman, D.Bell, J.H. Degnan, T.W. Hussey, and B.W. Mullins, Journal of Applied Physics, 76, 15 July 1994, pp. 637-647.

15 J.H. Degnan, F.M. Lehr, J.D. Beason, G.P. Baca, D.E. Bell, A.L. Chesley, S.K. Coffey, D.Dietz, B.D. Dunlap, S.E. Englert, T.J. Englert, D.G. Gale, J.D. Graham, J.J. Havranek, C.D. Holmberg, T.W. Hussey, R.A. Lewis, C.A. Outten, R.E. Pertkin, D.W. Price, N.F. Roderick, E.L. Ruden, U. Shumlak, G.A. Smith, and P.J. Turchi, Physical Review Letters, 74, 2 January 1995, pp. 98-101.

16 Chiang *et al.* 1994, page 637.

17 V. Mokhov *et al. Soviet Physics* Dok., 24, 1979, page 557.

18 G.Gaidos, R.A. Lewis, G.A. Smith, B. Dundore, S. Chakrabarti, First IAA Symposium on Realistic Near-Term Advanced Scientific Space Missions, Turin Italy, 1996.

19 Gaidos *et al.*, first page of report.

20 Defense Advanced Research Projects Agency; http://web-ext2.darpa.mil/mto/mems/frameset.html?overview.html

21 Federation of American Scientists webpage http://www.fas.org/irp/program/collect/global_hawk.htm

22 G. Nykolak, P.F. Szajowski, D. Romain, G.E. Tourgee, H.M. Presby, J.J. Auborn, Proceedings of SPIE - The International Society for Optical Enginnering *Proceedings of the 1999 Optical Wireless Communications II,* Sep 22 1999,

23 *The Airborne Laser and the Future of Theater Missile Defense,* AU/ACSC/0581/97-3, Major Gerald W. Wirsig, 1997.

24 NASA Environmental Research Aircraft and Sensor Technology webpage; http://www.dfrc.nasa.gov/Projects/Erast/

25 G. VanWiggeren and R. Roy, *Science,* 279, 20 Feb. 1998, pages 1198-1200.

26 H. Zbinden, J. Gautier, N. Gisin, B. Huttner, A. Muller, W. Tittel, *Electronic Letters,* 27, March 1997.

27 *Fighter Combat: Tactics and Maneuvering*, Robert Shaw, Naval Institute Press, Annapolis MD, 1985,